MAY 1960

WIRE AND WIRE PRODUCTS

MEET ANOTHER PROFITMAKER FOR YOU

in Vaughn wire-handling equipment

VAUGHN 4,000 lb. MOTOR DRIVEN SPOOLER

Note these outstanding features, typically VAUGHN: handles spools to 2" O.D. . . . overhung expanding arbor for 8" bore spools and larger . . . arbor can be manually- or air-operated . . . air-operated spool ejector carriage . . . new design impact-type fleeter . . . arranged for minimum floor space. Let us fill you in on the details!

The VAUGHN MACHINERY COMPANY

Cuyahoga Falls, Ohio, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Coulter & McKenzie DRAW·PAK *Equipment*

DRAW-PAK PAYS EXTRA DIVIDENDS

The customer required a take-up for electro-tinned copper wire which would assure *trouble-free* payout to high speed drawing machines. Coulter & McKenzie immediately provided the solution with two Series "500" DRAW-PAK units arranged in banks of six capstans each.

These DRAW-PAK machines not only solved the original payout problem by eliminating frequent breaks and tangles, but they extended the length of the run and yielded *seven additional major improvements* in the product and operation. Look at the extra dividends which the DRAW-PAK paid:

1. **A full number draw is taken during take-up operation.**
2. **Tinning speed increased from 300 to 500 feet per minute.**
3. **Size of take-up package *doubled* — 250 lbs. to 500 lbs.**
4. **Higher degree of tension control assures more uniformity in the electro-tinning process.**
5. **Number of strands per plating tank increased from 4 to 6.**
6. **Fewer "lost" strands in tanks due to breaks.**
7. **25% to 30% increase in efficiency due to longer continuous runs.**

If you want to learn more about how the Coulter & McKenzie DRAW-PAK can help you, write to us today.

This equipment manufactured under one of the following U. S. Patents 2,732,066; 2,868,474; 2,844,416; 2,868,268 or others pending.

Barron & Crowther Ltd., Eastleigh, England. European Draw-Pak Licen Idos Industries Ltd., Royston, Herts England, Sales Agents.

35 UNION AVENUE

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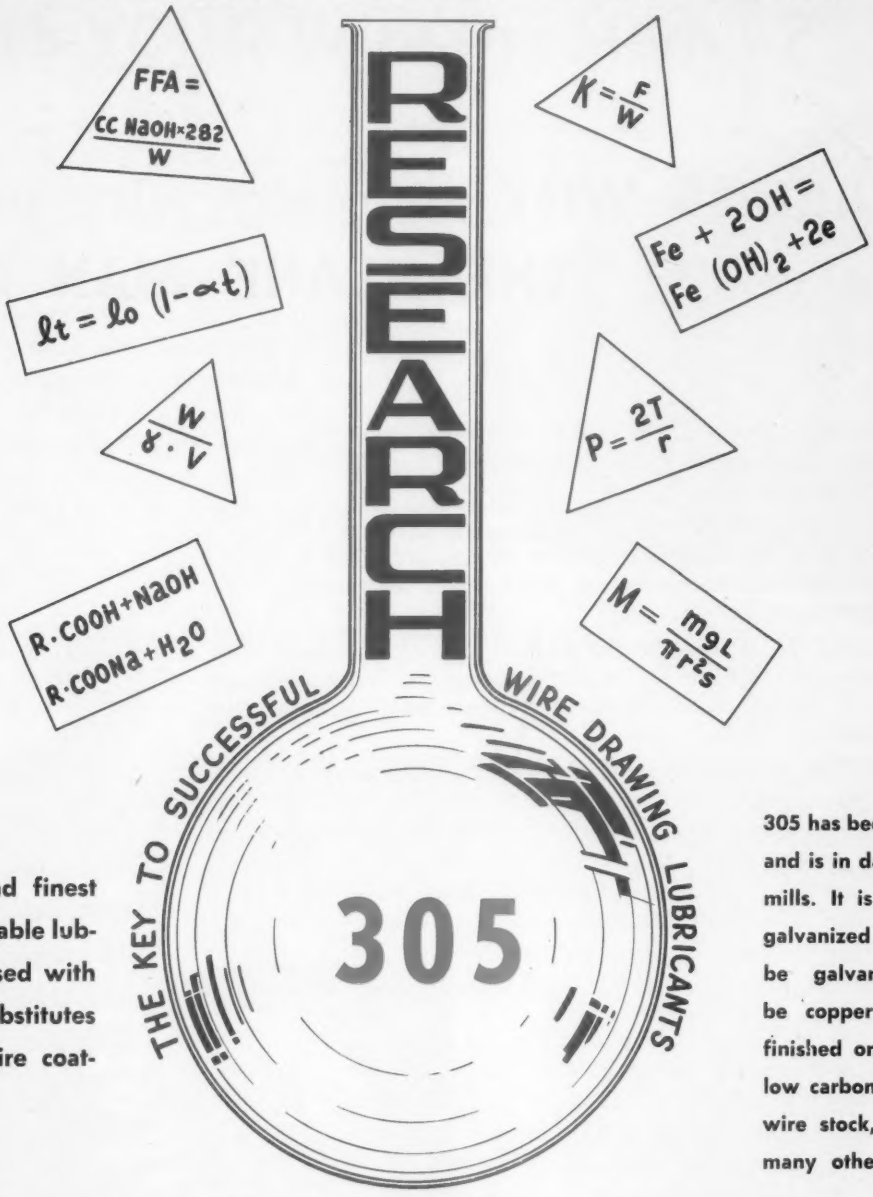
THE COULTER & McKENZIE MACHINE CO., INC.

SINCE 1843 BRIDGEPORT 7, CONNECTICUT, U.S.A. INCORPORATED 1881

"America's Finest Wire Draw"



The newest and finest of readily cleanable lubricants to be used with lime or lime substitutes for rod and wire coatings.

305 has been mill approved and is in daily use in major mills. It is being used on galvanized redraw, wire to be galvanized, wire to be copper coated, liquor finished on both high and low carbon, heatron spring wire stock, nail stock and many other wires.

"Look to Standard for the Future"

Cordially yours,

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

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#8100 COMPOUND

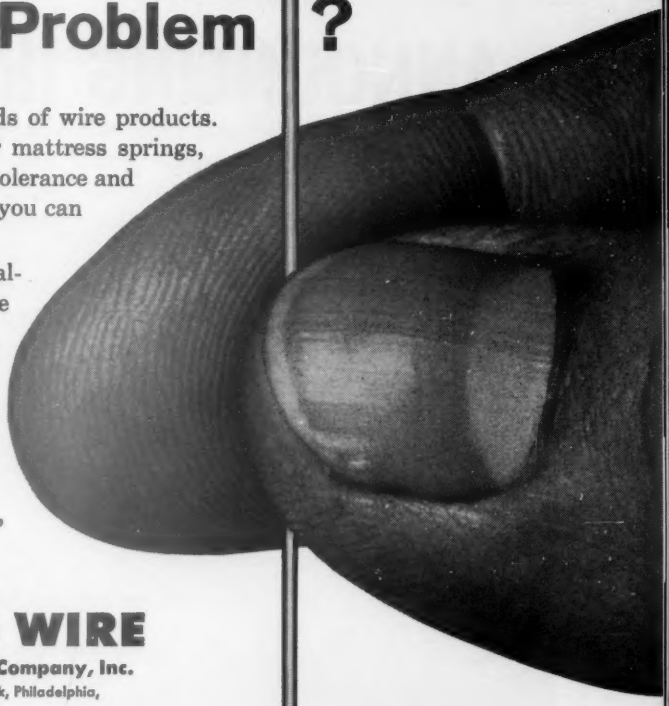
7 REASONS WHY so many wire people are calling THE BLANE MAN for it

1. The Wire & Cable Industry has proven that Blane #8100 Compound gives dependability for 80°C & 90°C applications.
2. BLANE #8100 Compound is designed primarily for 80°C and 90°C Appliance wire, it has provided the dependability necessary to meet UL's accelerated aging requirements.
3. BLANE #8100 specifically passes the critical tests of 7 days at 113°C in 1/64" wall thickness and 7 days at 121°C in 1/32" wall thickness with a good margin of safety.
4. BLANE #8100 Compound is the only compound in its price range that has consistently met UL requirements of 7 days aging at elevated temperatures.
5. Blane's versatile #8100 Compound is UL bulletin approved for TW, including 60°C in oil, making it applicable for 90°C machine tool wire.
6. In addition to its high temperature features BLANE #8100 Compound has outstanding low temperature characteristics and is recommended for MILW 76A applications.
7. The BLANE MAN specializes in personal friendly service.

Why don't you plan to get acquainted with the BLANE MAN'S #8100 Compound? Samples and technical data on request.

THE BLANE CORPORATION
CANTON, MASSACHUSETTS

What's YOUR Wire Problem ?



• PAGE manufacturers wire is a logical choice for hundreds of wire products. Whether you make hairpins or lock washers, paper clips or mattress springs, PAGE wire will give you the tensile strength, ductility, finish, tolerance and other properties you require. Regardless of your use of wire, you can count on PAGE uniformity.

PAGE facilities are designed to produce a wide range of high quality manufacturers wire items—including special shapes. Where requirements are exacting, you will find PAGE wire unexcelled.

Since 1902 we have pioneered many "firsts" in the wire industry. The latest of these is corrosion-resistant ACCO *Aluminized* Wire—commercially pure aluminum bonded to a steel core.

LET'S TALK WIRE! *Get in touch with us for your wire needs. Gain the benefit of* PAGE *experience and "wire know-how" to improve your product and lower your costs.*

ACCO

PAGE MANUFACTURERS WIRE

Page Steel and Wire Division • American Chain & Cable Company, Inc.

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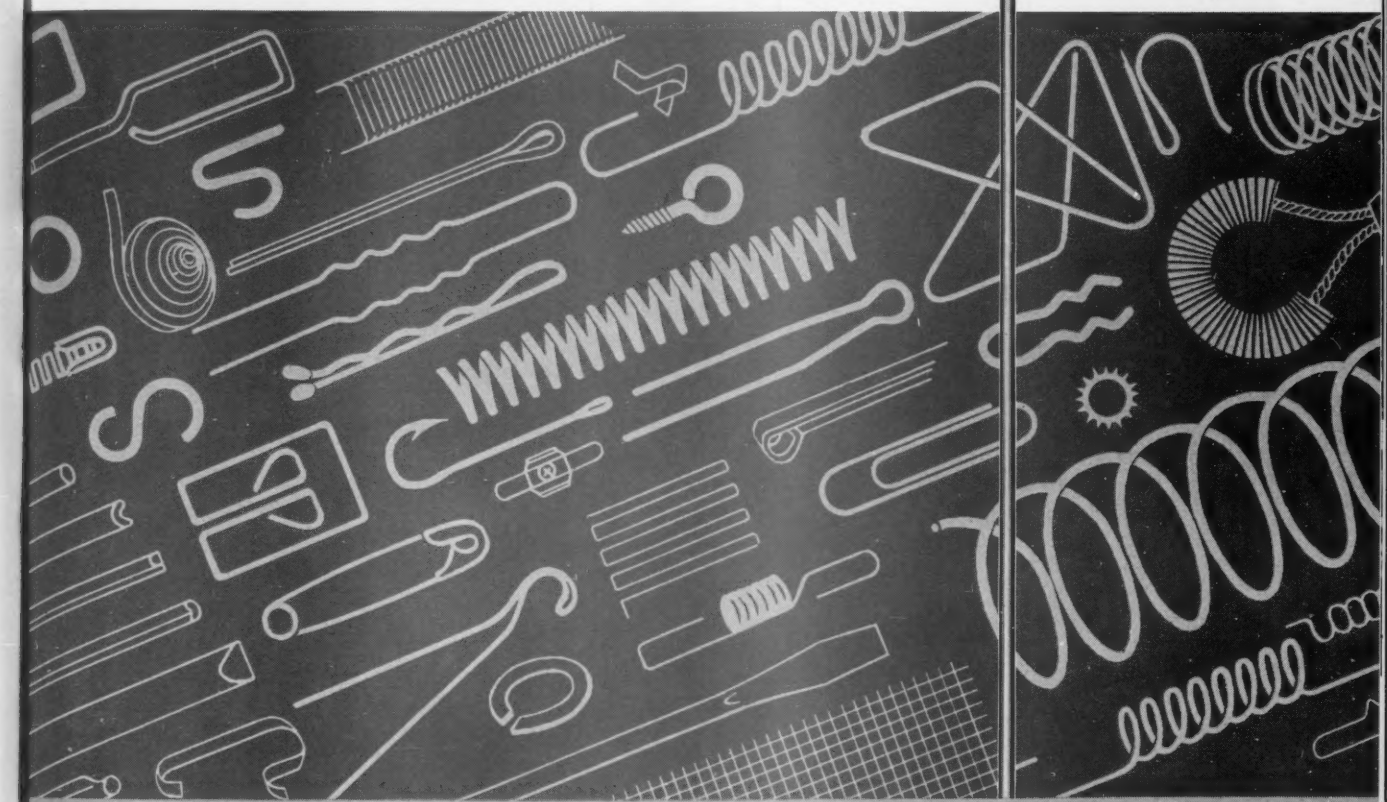

PAGE *—the source for answers to wire problems*

ANNOUNCING the WYREPAK

FEATURES

1. TURNTABLES COMPLETELY ENCLOSED.
2. BALL JOINT MOUNTED GUIDE SHEAVES FOR ALL ANGULAR SETTINGS.
3. ELECTRO-MECHANICAL TENSION CONTROL FOR EACH HEAD.
4. PRECISION GROUND PRESSURE ROLLS.
5. PRIME RUBBER LAGGED CAPSTAN.
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7. ALUMINUM CAPSTANS, WITH HARD-ANODIZED, POLISHED RUNNING SURFACES.
8. INDIVIDUAL MAINTENANCE ON EACH SECTION.

The drum packaging Take-Up System illustrated, Model S5-TC-S, was designed especially for Magnet Wire.

Other models are made for all types of ferrous and non-ferrous wires.

Advanced engineering and precision construction have evolved in this machine new concepts of speed and efficiency in the packaging of wire. Capacity: Min. size — #32 ga.; max. size — #20 ga. wire.

YOU ARE INVITED TO SECURE COMPLETE DETAILS REGARDING THIS ADVANCED PROCESS FROM —

Advanced Wyrepak Co., Inc.

11 HARRISON COURT PHONE: EDison 4-4274 BRIDGEPORT, CONN.

OR The Vaughn Machinery Co., CUYAHOGA FALLS, OHIO

WIRE AND WIRE PRODUCTS*

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

VOL. 35 MAY, 1960 No. 5

Designated as Official Publication By The Wire Association

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TWO KINDS OF PEOPLE USE

CAREW CUTTERS

EXPERIENCED & INEXPERIENCED

THE INEXPERIENCED DON'T KNOW ANY BETTER. THE EXPERIENCED DON'T KNOW ANY BETTER EITHER.

FOR THERE IS NO BETTER

Whether or not you are experienced, you can benefit by our 96 years of experience.

CAREW CUTTERS
are used in wire and spring plants throughout the world.

FOUR SIZES
CUT WIRE TO ¼" DIAM.
made by

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stocked by most
Mill Supply Jobbers

96 Years of Cutting Wire and Costs

NOW! at low cost twist any number of conductors to make cable up to 1" diameter

only the COOK MULTIPLE INSULATED WIRE TWISTER provides such flexibility

Here's a twister that offers the flexibility required of today's wire mills manufacturing insulated cables. It's truly flexible . . . you can make any cables required up to 1" diameter.

And, because the COOK MULTIPLE INSULATED WIRE TWISTER is so low in cost, it is the practical addition to your plant. Compare it with any other machine on the market doing this work . . . compare its performance . . . compare its cost . . . compare its construction. Why not see for yourself . . . write for complete specifications and prices today.

SPECIFICATIONS

Production	9,000 ft/hr at 7½" lay
Reel Size	30" std. also from 16-36" dia.
Floor Space	6 ft. x 8 ft. max.
Lay Range	¾" to 7½"
Twist	Right or left hand
Finished Wire Size	Up to 1" dia.
Wrapping Head	Optional
Neutralizer	Optional

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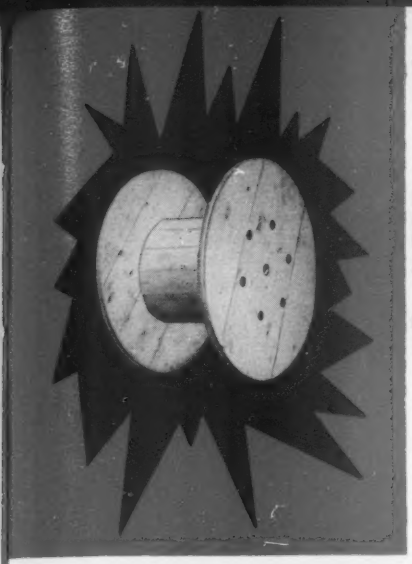
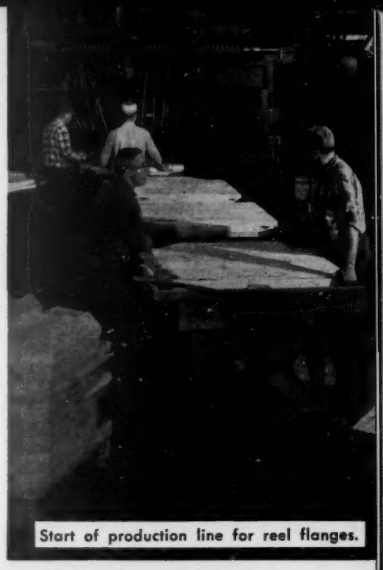


YOU SAVE WITH NON-RETURNABLES

BRIDGE REELS, through manufacturing techniques that have been continuously improved and streamlined, have become pre-eminently the standard for quality and dependability.

Look at these Advantages:

- Reduced Reel Investment
- Less Storage Space
- Lower Freight Costs
- No Return Freight Charges
- No Bookkeeping
- No Repair Costs
- No Deposits Needed
- No More Headaches! !



Start of production line for reel flanges.

Why BRIDGE REELS are Tops:

- Lumber Kiln Dried at Plant
- Latest and Finest Reel Manufacturing machines —many made to Bridge Special Specifications
- Fabricating methods continuously improved
- Fast, Efficient Straight-Line Flow of Production Work
- Painting and Stenciling Completed in approximately 4 Minutes
- Reel Assemblies made with many unique Mechanical Innovations
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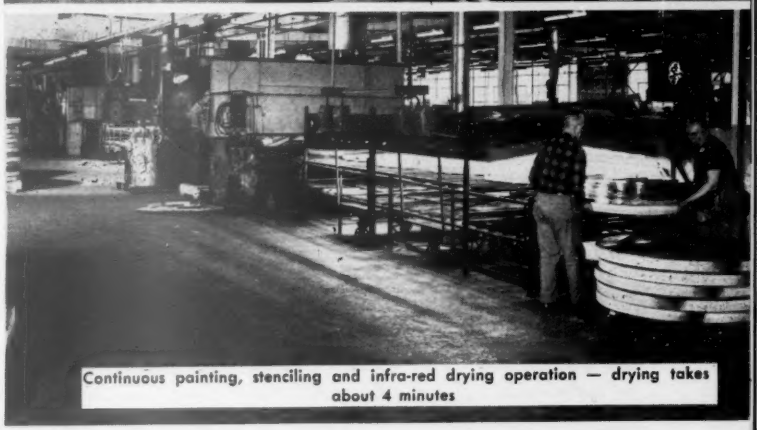
NON-RETURNABLE

WOOD REELS IN ALL SIZES FOR ALL TYPES OF ELECTRIC WIRE AND CABLE

Production line band sawing and multiple boring.

Small reel bench assembly and loading area.

NON-RETURNABLE REELS GIVE YOU A DEFINITE PACKAGING COST



Continuous painting, stenciling and infra-red drying operation — drying takes about 4 minutes

"REEL" GOOD —

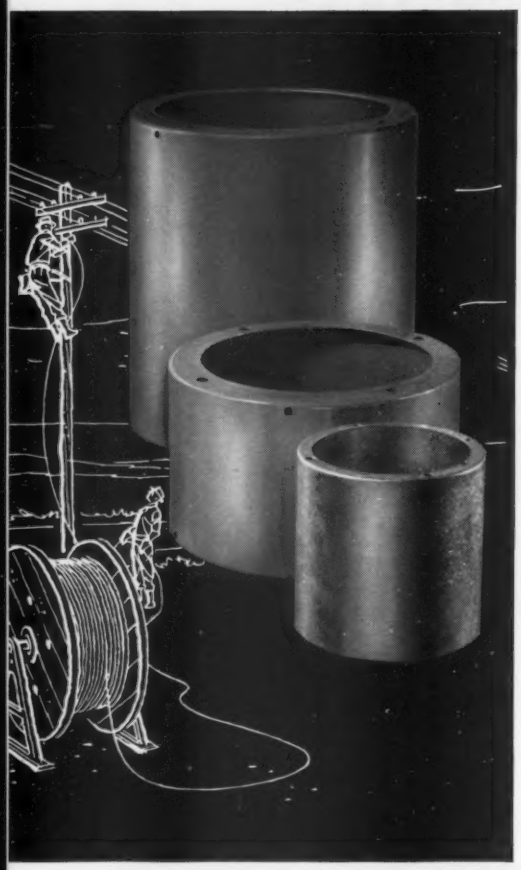
Let us quote on your Reel needs. Send in your specifications. Better yet, visit our plant and see how Reels are made so well at so low a cost.

WOOD REELS

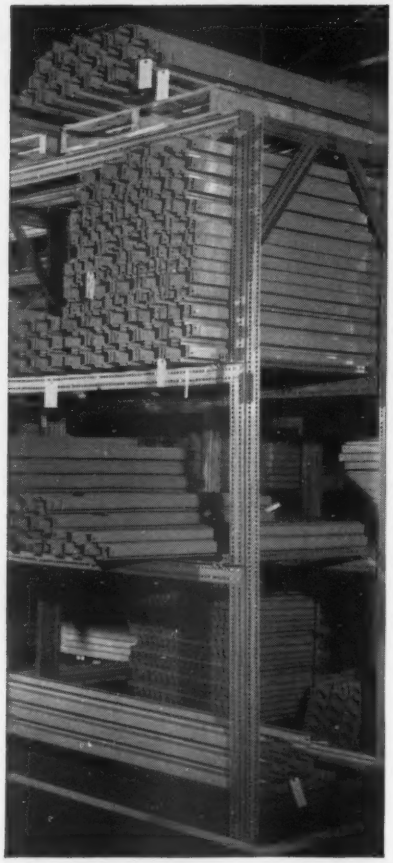
HIGH-SPEED SHIPPING SERVICE IN OUR OWN TRUCKS WITHIN A RADIUS OF 250 MILES OF THE PLANT, FAST FREIGHT WILL BRING YOU BRIDGE REELS WITHIN A FEW DAYS TO POINTS EAST OF THE MISSISSIPPI

TEL: THOMPSONVILLE, CONN.

STANDARD REPUBLIC MATERIAL HANDLING PRODUCTS SOLVE STOCK, STORE, SHIP PROBLEMS

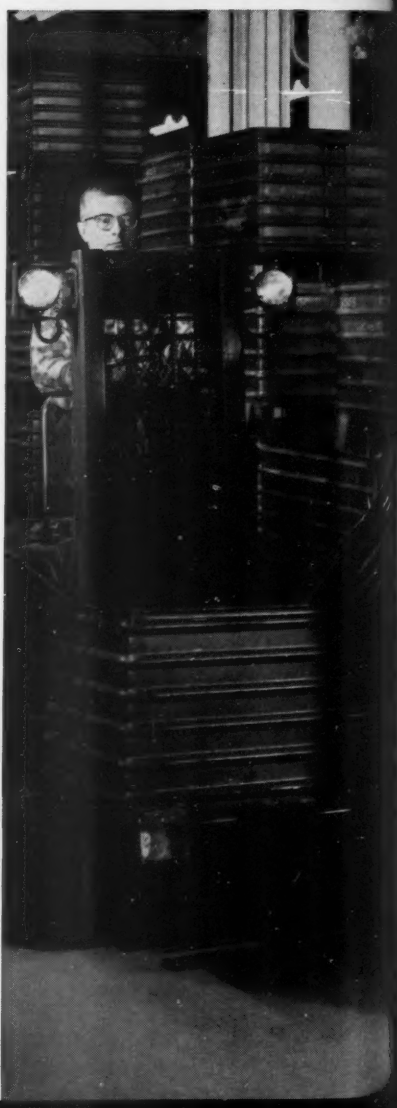


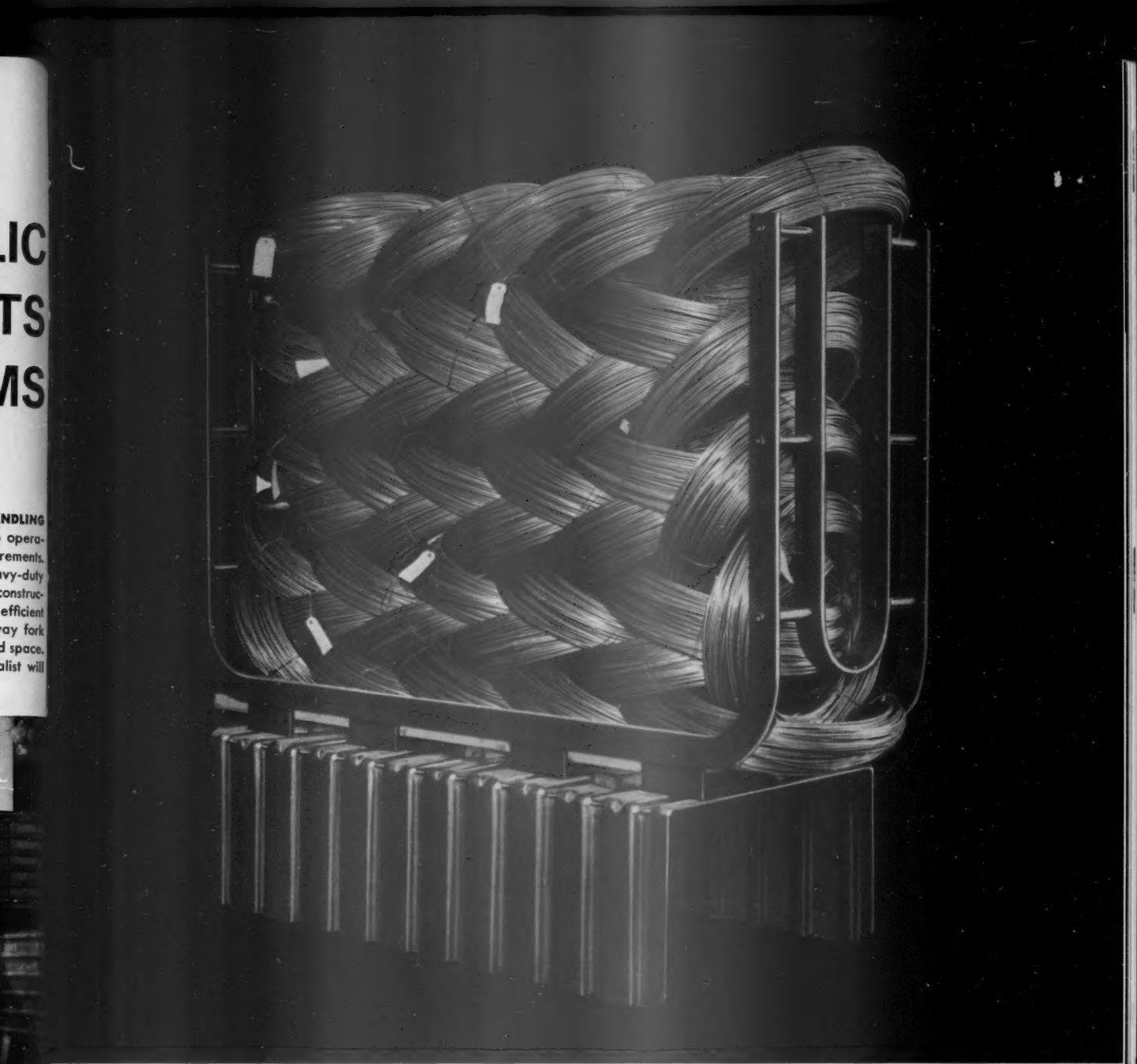
REPUBLIC FLANGED STEEL TRAVERSES save time, labor, money. Simple four-way assembly; no special tools required; long, trouble-free service. And Republic Steel Traverses are reinforced where it counts—at flange base and bolt holes. This makes possible the use of lighter gage steel, reduces weight 20%, with highest strength-to-weight attainable. Available in either plain, painted, or hot dip galvanized finish. Flange width, and bolt and drain holes furnished to your specification. Choose from the industry's most complete line. Over 100 sizes ranging from 12″ to 56″ diameter—6″ to 48″ lengths. Immediate delivery.



REPUBLIC METAL LUMBER® provides faster, stronger, safer framing. Ideal for erecting shop-built, tailor-made storage facilities for hard-to-handle stock-and-store materials. Erection is easy. Simply measure, cut, assemble with self-locking bolt and nut fasteners. METAL LUMBER is fabricated from cold rolled steel to assure uniform physical properties, and high strength-to-gage ratio. Bonderized after fabrication for complete protection of all exposed parts. Available in two gages, two widths, in standard bundles of either 10- or 12-foot lengths, complete with fasteners. Write for more information.

STANDARD REPUBLIC MATERIAL HANDLING UNITS save time in stack, store, ship operations. Reduce storage space requirements. Standard Republic Boxes feature heavy-duty stacking brackets and corrugated construction that combine to deliver long, efficient service at low per-year cost. Four-way fork channels simplify handling in restricted space. A Republic Material Handling specialist will work with you. Call or write today.





REPUBLIC STACK 'N STORE UNITS provide a practical and economical solution to the problem of wire handling. These units are especially adaptable to bulk material, such as coiled wire, that does not require the use of completely enclosed sides. Specially designed "U" shape superstructure permits high stacking of coiled wire. Fully loaded superstructures are handled quickly and easily by crane. Or superstructures may be placed on skids and the entire unit readily moved to store-and-ship areas by lift trucks. Republic Stack 'N Store Units save valuable floor space, eliminate cluttered aisles, reduce handling time.

If you have a material handling problem, call your Republic-Berger representative. Republic Material Handling specialists will work with you, will recommend the right standard units to do your job right. Call or write today.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
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Please send more information on the following products:

- ☐ Republic Flanged Steel Traverses
- ☐ Republic Material Handling Units
- ☐ Republic Stack 'N Store Units
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☐ METAL ☐ LUMBER

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PVC Resins & Compounds

PVC RESIN—**BLACAR #250**—UL approved for complete interchangeability in recognized compounds. High molecular weight—low gel count—excellent dry blending and extrusion characteristics. Intermediate and low molecular weight resins also available.

PVC COMPOUNDS—In natural, white or black-dry blend or diced.

BLACAR #2800—UL approved for type T and TW wire—oil at 60°C—80°C appliance wire.

BLACAR #2700—UL approved, primary insulation, for type T, TW, TF, TFF wire—oil at 60°C—wide range of low-tension applications.

BLACAR #2600—UL approved for type TF and TFF wire and cable insulation.

Specialists in wire covering—Cary has a compound for every UL requirement. Our summary of recommended compounds is available on request.

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Mail address: **P.O. BOX 1128, NEW BRUNSWICK, N. J.**

Plants at: East Brunswick and Flemington, N. J.

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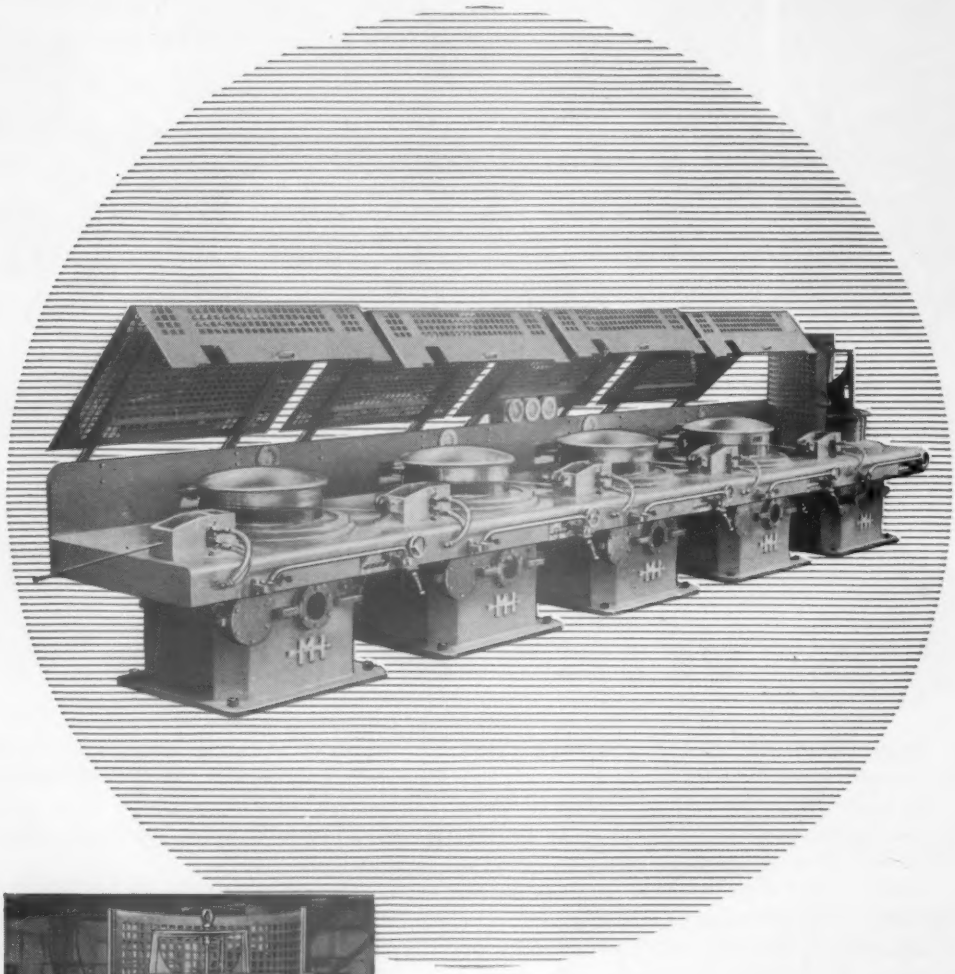
PRECISION WITH RUGGEDNESS



The heavy size:
BEELINE DG-5
with five 28" blocks
for
PRESTRESSED
CONCRETE WIRE
max. about
.55" rod.

Easy "casting" control

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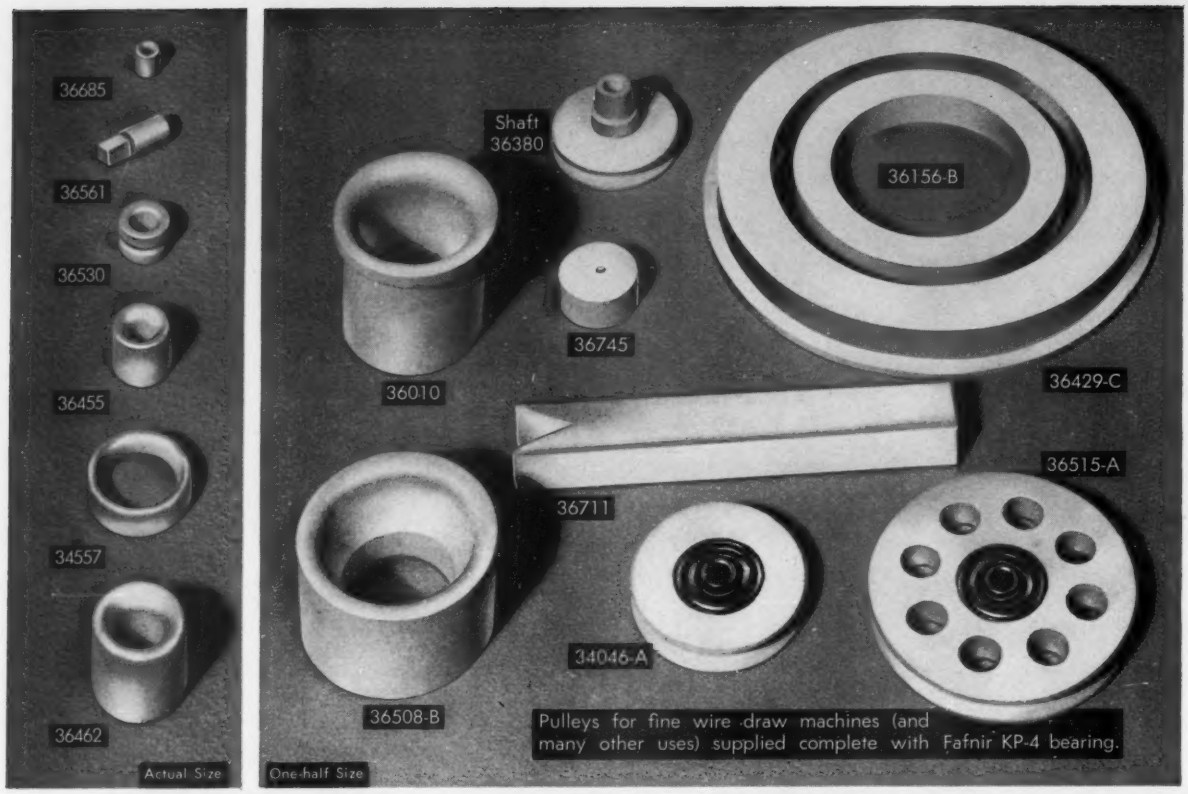


AlSiMag guides for fine wire draw machines, bunchers, hold down guides, sheave applications and others.

AlSiMag® Alumina Ceramic WIRE GUIDES

More wear resistant than the hardest metals. Smooth. Hard. Non-corrosive. High heat resistance. Held to precision tolerances where necessary. Homogeneous. Since the material is the same all the way through, gradual wear simply exposes new surfaces of the same material.

AlSiMag guides are available in various degrees of finishes for specific applications.

Standard or custom designs. Wide range of shapes and sizes. Samples of present production sent on request. Test samples to your specifications supplied promptly at reasonable cost.

• For complete information, send sample of guide or drawing, together with details of your processes and materials.

A Subsidiary of Minnesota Mining and Manufacturing Company

AMERICAN LAVA CORPORATION

CHATTANOOGA 5, TENN.
58TH YEAR OF CERAMIC LEADERSHIP

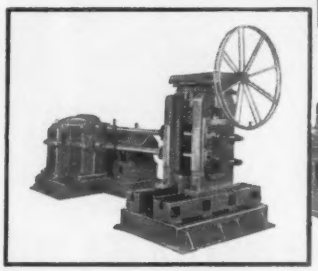
SALES ENGINEERS: NEW ENGLAND: W. J. Geary, 27 Fairlawn St., Cranston, R. I., Williams 1-4177. • NORTHEAST: J. S. Gosnell, 205 Walnut St., Livingston, N. J., WYman 2-1260. • SOUTHEAST: James W. Crisp, Route 4, Taylors, South Carolina, CHurchill 4-0063. ALL OTHER AREAS: J. B. Shacklett, W. M. Crittenden, Jr., or W. H. Cooper, American Lava Corporation, Chattanooga 5, Tenn., AM 5-3411. **REPRESENTATIVES:** CANADA: Ian M. Haldane & Co., P. O. Box 54, London, Ont. • ALL OTHER COUNTRIES: Minnesota Mining & Manufacturing Co., International Division, 99 Park Ave., New York, N. Y.

Whatever your requirements . . . SECO's staff of trained engineers can help you solve any special Mill problem you may have . . . from creative designing through installation (including *all* required auxiliary equipment).

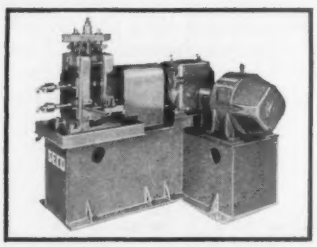
Should your problem involve a special Cluster Mill (to accommodate either ferrous or non-ferrous metals), or a Hot Rolling Mill that bonds non-ferrous metal to a steel base . . . SECO can supply.

Custom Built
HOT ROLLING MILLS
by SECO
assures
Predictable Performance

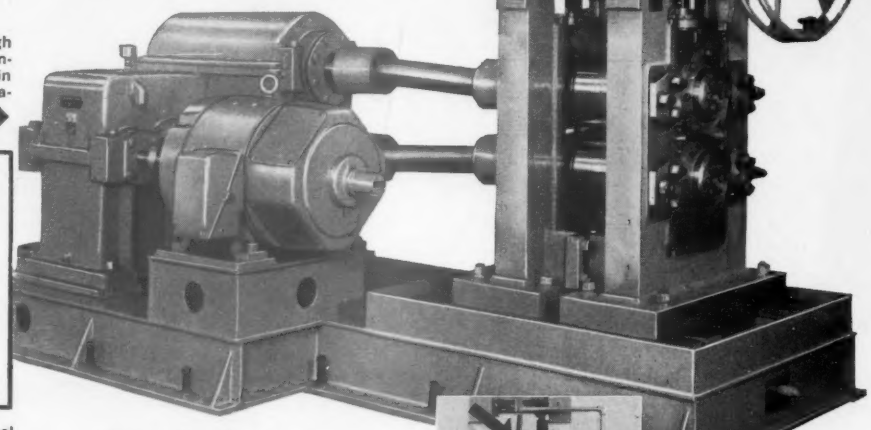
A special, custom-built 2-high Hot Roll Flattening Mill for non-ferrous metals. (Can be built in 2 or 4-high types or a combination of both.) ▶



▲ A SECO designed and built Bi-Metal Bonding Mill on movable mountings.

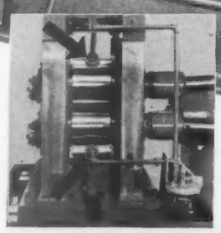


▲ A 6-inch, 2-high Wire Flattening Mill for single or tandem use.



Special Features: ▲

- Water-cooled chocks for lubrication
- 900° F. rolling temperature
- Hand wheel screw-down (adaptable for power)
- Special alloy steel rolls
- Timken Tapered Roller Bearings
- Can be built for 8, 10, 12 or 16-inch widths.



◀ Mill is equipped with two gas jets as a means for pre-heating rolls (see arrows).

SECO

STEEL EQUIPMENT COMPANY

P. O. BOX 737, WARRENSVILLE STATION

CLEVELAND 22, OHIO

SECO STEEL MILL EQUIPMENT

- Leveling and Shearing Lines
- Combination Edging and Flattening Lines
- Tension Reels for Strip Polishers
- Narrow Strip Grinding Machines
- Slitting Lines
- Multiple Strand Pull-out Rolls and Take-up Frames
- Strip Coilers (Up and Down Type)
- Traverse Reels for Narrow Strip
- Steel Coil Up-enders
- Scrap Ballers

Affiliated with Lee Wilson Engineering Co., Inc.

TELLING THE POLYETHYLENE WIRE STORY CAN BUILD FUTURE PROFITS FOR YOU

Polyethylene-covered line wire has many advantages for users: Exceptional weather and stress-crack resistance. Easy handling and installation. Long life in service. Fewer outages and minimum maintenance.

We've been telling your customers the polyethylene story in utility magazines through advertisements like those above. And more and more users are specifying polyethylene covering for line wire and many other applications. Why not join us in this effort?

Polyethylene can make your operations simpler, with a more profitable future too.

- The resin comes ready-to-use — nothing to add, no blending, no milling, no post-extrusion vulcanizing. With production based completely on polyethylene, one line replaces several, providing savings in equipment, floor space, maintenance and labor. And there's only one material to purchase and inventory.
- Unlike costs of other insulating materials, which are trending upward, polyethylene price history promises long-term stability. This means polyethylene can be expected to be your most profitable line wire coating in the years ahead.

You can build a solid base for future sales and increased profits by promoting polyethylene line wire now among your customers and prospects.

As you make recommendations, you will find our new data sheet, "PETROTHENE® Resins for Wire and Cable Industry", helpful in selecting resins with the proper balance of properties for different applications. Also available is U.S.I.'s comprehensive 100-page "PETROTHENE Polyethylene . . . A Processing Guide." Write for your copies.

U.S. Industrial Chemicals Co.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.

Please send me:

☐ "PETROTHENE Resins for the Wire and Cable Industry"
☐ "PETROTHENE Polyethylene . . . A Processing Guide"

Name_____
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Company_____
Address_____
City & State_____

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities

MICROMETER PRECISION MICRO-WELD ®

CO-OPERATION . . . THE KEY TO SUCCESS IN ANY FIELD!

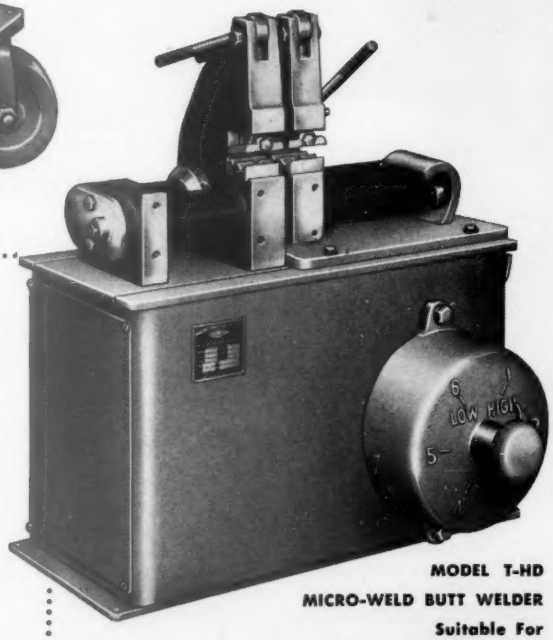
MODEL T-HD MICRO-WELD BUTT WELDER MOUNTED ON 4-WHEEL TRUCK
Capacity ⅛" to ⅝" Diameter
Low and Mild Carbon Steel

The wire industry of the American hemisphere co-operating with MICRO PRODUCTS COMPANY developed efficient Butt Welders for the world of wire . . . Model T-HD MICRO-WELD heavy duty Butt Welder has proven it's worth in "co-operating" with cold heading equipment, and other requirements for Butt Welding low and mild carbon steel wire and rods in a range of ⅛" to ⅝" diameter.

Built for heavy duty service, headpieces are made from bronze, transformer housing and truck are combined into a substantial unit, fabricated from rolled steel plates and arc welded.

The model T-HD MICRO WELD Butt Welder is a general purpose butt welding machine, equipped with manual spacing mechanism, individual hand clamps, manual spring upset mechanism, welding dies to accommodate the full range of sizes without changing dies, self-equalizing pivoted clamping shoes operated through simple positive cam clamps with heavy inserted coil springs to compensate for size variations. These features together with conveniently located controls contribute to higher production with a minimum of time required for loading and unloading.

Can be supplied mounted on 4-caster wheels or suitable for bench mounting.



MODEL T-HD MICRO-WELD BUTT WELDER Suitable For Bench Mounting

MS SW MID-STATES STEEL & WIRE COMPANY

SIMMONS COMPANY

ACCO
A·C·G
TRADE MARK

CONTINENTAL STEEL

LACLEDE

STELCO

CF&I

These are some of the users of model T-HD MICRO-WELD Butt Welders.

MICROMETER PRECISION MICRO-WELD ®

MICRO PRODUCTS COMPANY

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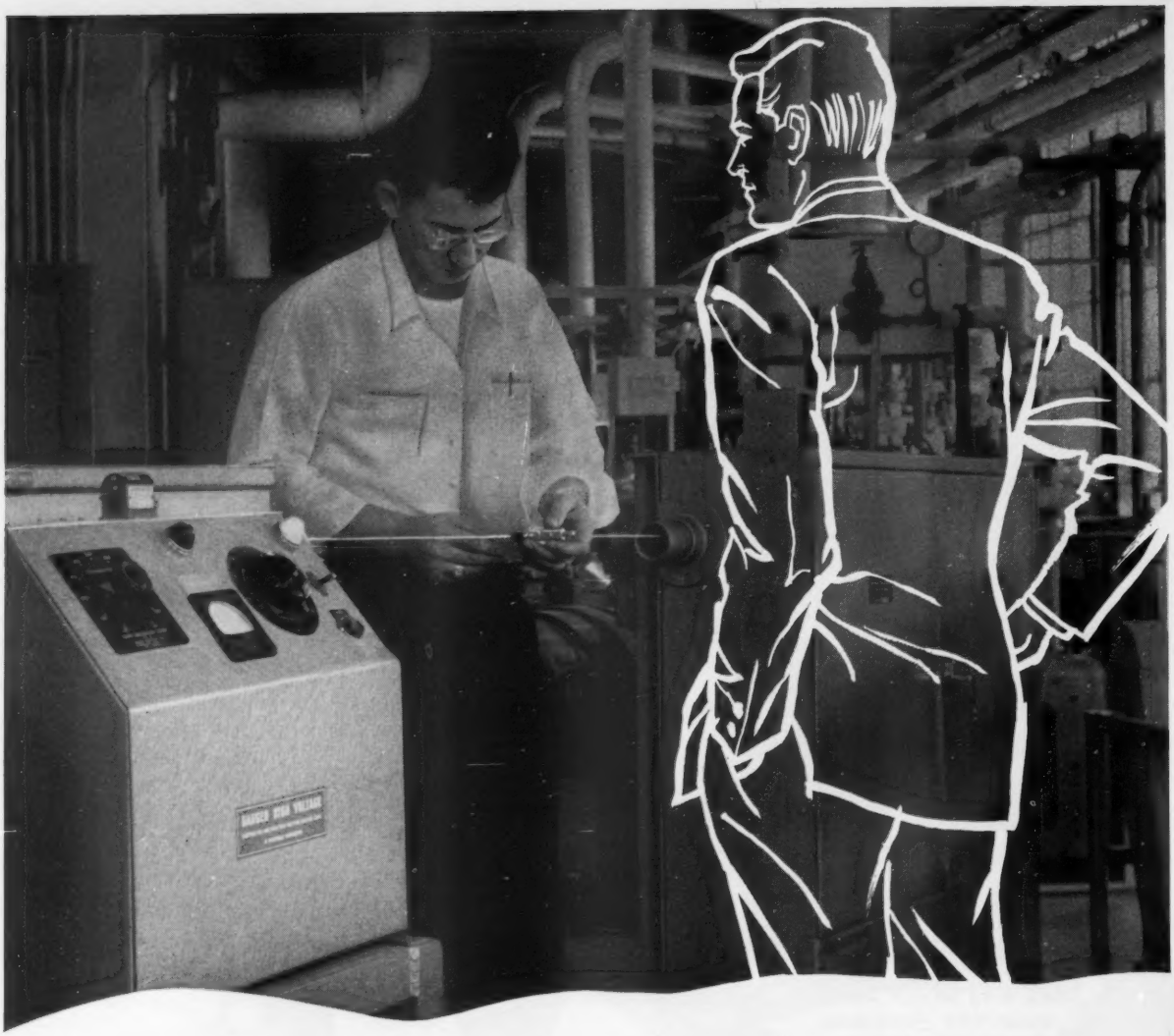


TWO NEW SOLUTIONS FOR "HOT" WIRE PROBLEMS

...FROM YOUR SILICONES MAN

Two new low shrink silicone rubber insulating compounds... developed by the UNION CARBIDE Silicones Man... are now solving many of today's electrical wire and cable insulation problems. Offering good dielectric and physical properties with easy processing, they are ideal materials for air frame applications, motor truck wires, motor leads and hook-ups, small appliance wiring, and marine wiring.

UNION CARBIDE K-1347 Silicone Compound is a premium quality stock that meets tight military and industrial specifications. It has high green strength, remilling is easy, and it is readily colored for coding. Easily extruded, it provides a smooth, non-porous, high gloss surface, and can be braided without postcure. Physical properties are excellent using either steam or hot air cures.

For economy operations where good, but not premium, physical properties are needed, lower cost UNION CARBIDE K-1357 may well fill all requirements. Available precatalyzed in both slabs and coiled strips, it can be fed directly from carton to extruder on most equipment.

Both silicones have outstanding retention of tensile strength and elongation after prolonged exposure to high temperature. Both have dielectric strength of 1000 volts/mil. Both can be cured with either steam or hot air. And both are low shrink compounds. K-1347... for premium properties. K-1357... for economy.

For more information, write or call your UNION CARBIDE Silicones Man, or Dept. EZ -9905, Silicones Division, Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. *(In Canada:* Bakelite Company, Division of Union Carbide Canada Limited, Toronto 7, Ontario.)

Unlocking the secrets of silicones

Rubber, Monomers, Resins, Oils and Emulsions

UNION CARBIDE SILICONES

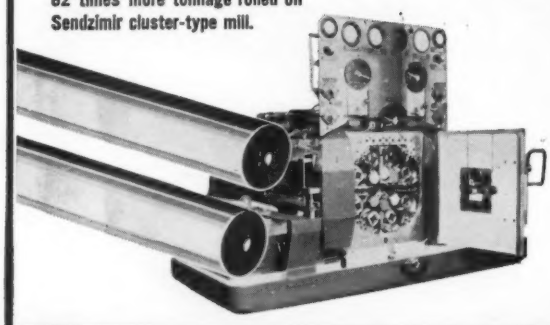
"Union Carbide" is a registered trade-mark of UCC.

Specialties of the House
ROEBLING is a specialist in galvanizing, with practically unmatched facilities for producing galvanized wire in enormous quantities and in complete size ranges. Hot galvanized is available in sizes from .283" to .035". . . Roegal (drawn galvanized) from .187" to .005".
You pay for the best when you buy galvanized wire. Make sure you get it—specify Roebling! Write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.
ROEBLING
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation
Roebling... Your Product is Better for it

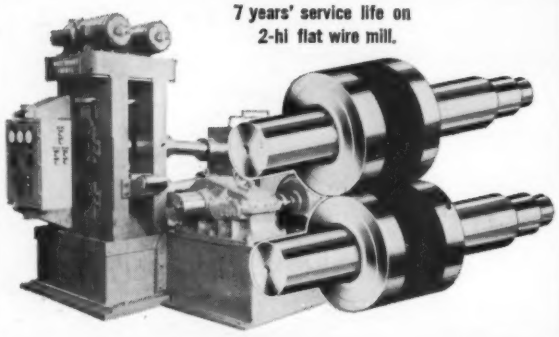
. . . ANOTHER TALIDE CASE HISTORY

20 YEARS' SERVICE WITH Talide® ROLLS at Jones & Laughlin Steel

82 times more tonnage rolled on Sendzimir cluster-type mill.



7 years' service life on 2-hi flat wire mill.



The Youngstown, Ohio plant of JONES & LAUGHLIN STEEL CORPORATION'S STAINLESS AND STRIP DIVISION (formerly Cold Metal Products Co.) reports that the TALIDE (Tungsten Carbide) work rolls used on their 4-hi cold rolling mills give INCREASED PRODUCTION, LONG SERVICE, FINE FINISH AND EXTREMELY CLOSE TOLERANCE. Over 25 pairs have been purchased during the past 20-year period —many of which are still in operation producing high quality strip steel of all analyses.

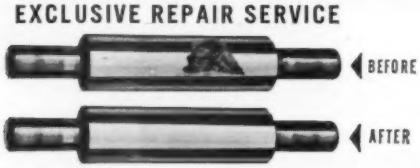
Metal Carbides pioneered and developed the original installations of tungsten carbide rolls and has successfully adapted them to all types of rolling mills including STECKEL, BLISS, UNITED, MESTA, STANAT, SENDZIMIR, WATERBURY-FARREL, TORRINGTON, RUESCH, FENN, WEAN, COLD METAL, LOMA, LOCKWOOD, TAYLOR, etc.

Talide work rolls are ultra-hard, extremely dense and porous-free. Strip steel and non-ferrous metals of all analyses are rolled down to thinner gauge, with more accuracy, greater reductions and with fewer anneals than possible with any other roll.

ONLY TALIDE WORK ROLLS GUARANTEE THESE ADVANTAGES

- ★ MORE PRODUCTION
- ★ BETTER FINISH
- ★ LONGER LIFE
- ★ HIGHER SPEEDS
- ★ CLOSER TOLERANCE
- ★ IMPROVED PHYSICALS
- ★ GREATER REDUCTION
- ★ LESS DOWN TIME
- ★ FEWER REJECTS
- ★ LESS MAINTENANCE

EXCLUSIVE REPAIR SERVICE



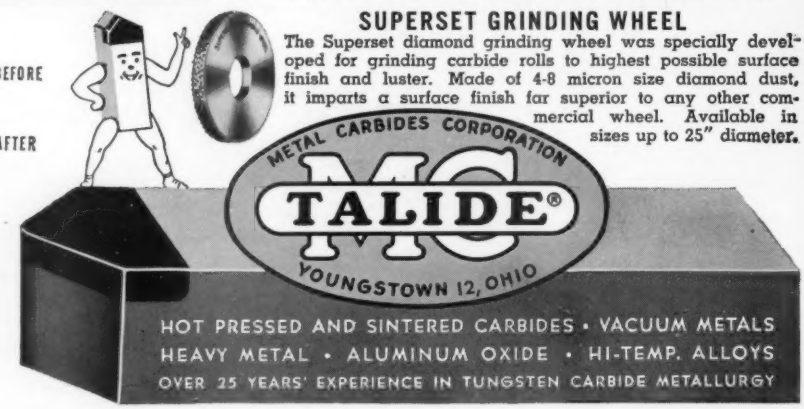
Broken or damaged carbide rolls can be reworked to first-class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

Talide Rolls are made in lengths up to 100" diameters up to 25", and up to 5000 lbs. by weight.

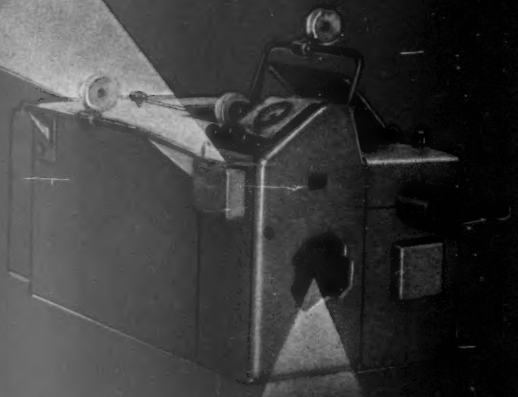
METAL CARBIDES CORPORATION
Youngstown 12, Ohio
Send for new 16-page catalog CR-58

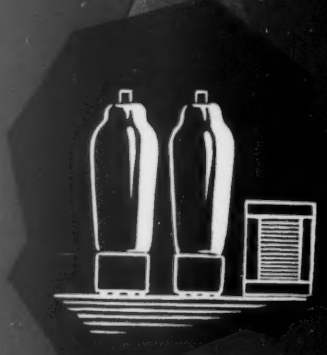
SUPERSET GRINDING WHEEL

The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter.


METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

NEW DEVELOPMENTS CONTINUE!





This Drawing Unit (Type 154 plus Spooler SO-150) produces finished wires within a range of BS32G and BS34, on spools up to 440 lbs. weight.

EXCLUSIVE REPRESENTATIVE FOR U.S.A. AND CANADA

AMERICAN LAUBSCHER Corporation

FISK BLDG. 250 WEST 57th STREET NEW YORK 19, N.Y.

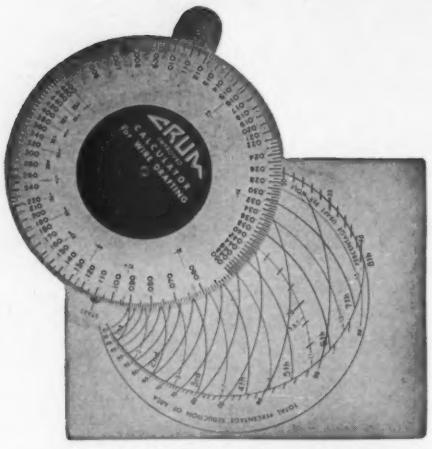
NIEHOFF MACHINE WORKS

SCHWABACH NEAR NURNBERG WESTERN GERMANY

SAVE SET-UP TIME WITH THE...

CRUM CALCULATOR
FOR WIRE DRAFTING

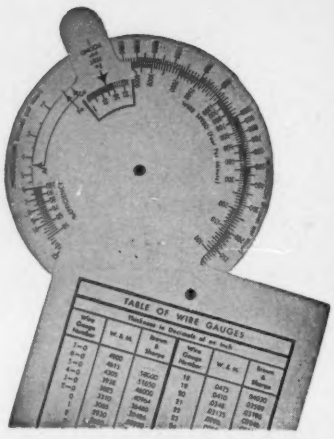
Useful and Accurate!



Front view of Crum Calculator

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. **Provide quicker and more accurate information on die sizes and reduction areas;**
2. **Calculate wire production rates for various speeds and efficiencies.**



Reverse view of Crum Calculator

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving—no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

Send your orders to:

WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)

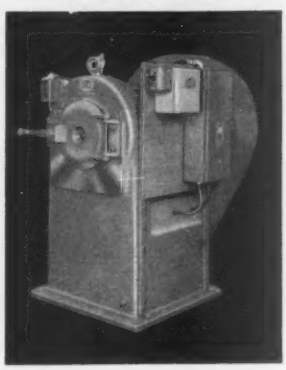
Left — Fenn Model 7F Swager. *Right* — A Model 6F points end of wire coil prior to drawing.

Wire Pointing with FENN Swaging Machines

The wide preference in the wire industry for Fenn Swaging Machines for primary pointing prior to drawing can be attributed to their ability to produce heavy reductions with dependability and with minimum maintenance. From the rugged one piece solid meehanite frames to the precision machined roll cage assemblies, Fenn Swagers are engineered and built to deliver under heavy production schedules. Only Fenn makes all types of swaging machines . . . in a complete range of sizes that will swage solids from 5/32" to 3-3/8" . . . and in 2-Die or 4-Die models. A complete line of manual and hydraulic feeds greatly increase the Swager's productivity and accuracy . . . with far less operator fatique. We invite you to consult with our swaging engineers.

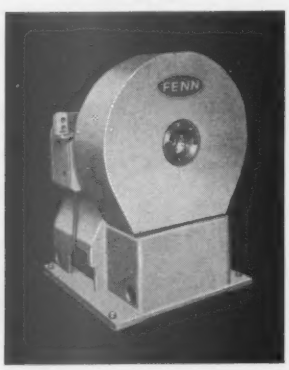
The Fenn Manufacturing Company, Newington, Conn.

Rotary 2-Die

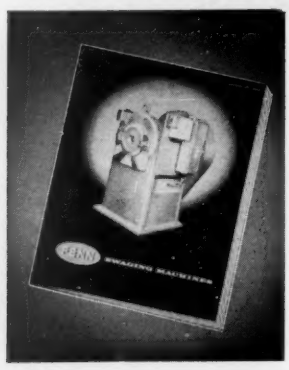


Rotary 4-Die

Stationary Die



Write for Catalog!



GRANODRAW SS Lubricant Base 300%, Cuts Heating Costs

Amchem Process Protects and Improves Surface Finish of Stainless Tubing

A 4000-gallon Granodraw SS operation is saving time and equipment, cutting costs and improving quality of stainless stock prior to drawing and reducing at Wallingford Steel—one of the world's largest producers of welded stainless steel tubing. In addition, Amchem Serseal chemical blanket has lowered heat costs, improved working conditions around the bath.

PRODUCTION TIME SAVED

Providing an excellent lubricant base, Granodraw SS has achieved an increase of 300 percent in drawing speeds at Wallingford's stainless tube reducing mill. Easily maintained and extremely stable, the Granodraw SS bath is left standing over a weekend, yet starts immediately in trouble-free operation for Monday morning operations!

VALUABLE EQUIPMENT PROTECTED

By preventing galling and seizing, and metal to metal contact between work and the dies, die life has been significantly increased. Drawing loads are between 20 and 25 percent less since use of Granodraw SS was instituted.

HEATING COSTS REDUCED

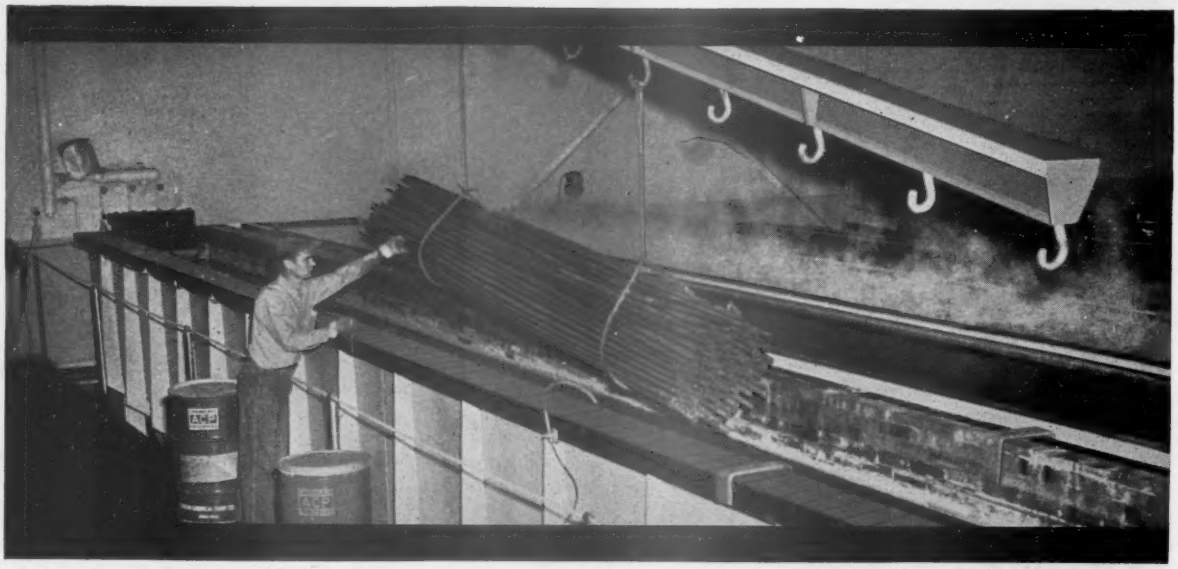
In conjunction with Granodraw SS, the Serseal chemical blanket for drawing operations has racked up additional savings in heat—up to 80 percent!—for Wallingford. With the bath effectively contained by Serseal, working hazards are reduced, corrosive effects are lessened on surrounding equipment—yet efficiency of the oxalate bath is not affected.

SURFACE FINISH IMPROVED

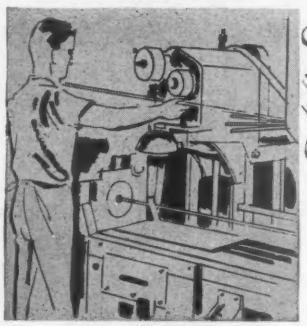
The Granodraw SS oxalate coating reacts with the metal surface, leaving a hard, spongelike deposit to which lubricants readily cling. As the stainless passes through the die, the lubricant melts and recrystallizes absolutely evenly —a sure sign of uniform, friction-free lubricating action and improved surface finish quality.

If your operations involve stainless tubes or wire drawing, cold heading or impact extrusion—find out how Granodraw SS can save you time, equipment and money while boosting product quality!

Increases Drawing Speeds and Rejects at Wallingford Steel!

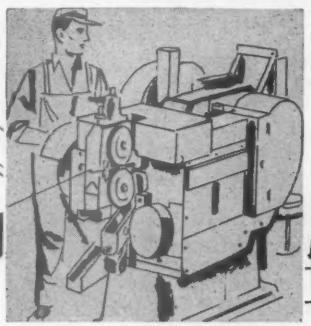


Stainless tubing prior to immersion in Granodraw SS bath at Wallingford Steel. Note absence of steam vapors and fumes, overall cleanliness of operation obtained by use of Amchem Serseal, new heat-reducing chemical blanket.

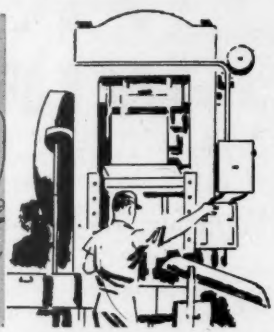


TUBE DRAWING

WIRE DRAWING



COLD HEADING



IMPACT EXTRUSION

Write for your copy of Bulletin 1437 on Granodraw processes, and further information on Serseal—two of the many Amchem chemicals for the metalworking industry.

AMCHEM

GRANODRAW SS

Amchem, Granodraw and Serseal are registered trademarks of
AMCHEM PRODUCTS, INC. (Formerly American Chemical Paint Co.)
AMBLER, PA. • Detroit, Mich. • St. Joseph, Mo. • Niles, Calif.

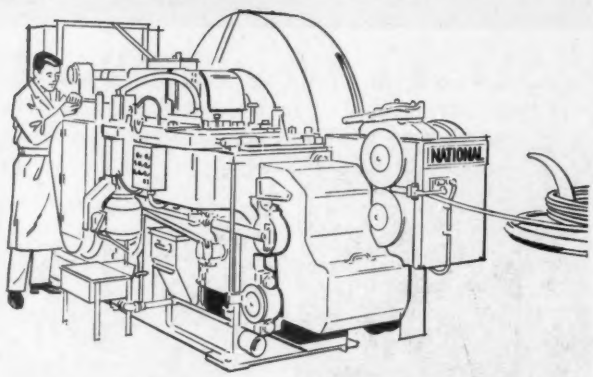
MADE FROM WIRE!

BOLTMAKERS make these interesting parts, and countless others, every day from wire.

Operations include cutting off, extruding, heading, trimming, pointing and thread-rolling.

It's just possible *your* metal parts can be made faster, stronger and at lower cost in Boltmakers (or in other types of Nationals).

May we help you investigate?



NATIONAL 1/2-INCH BOLTMAKER
4,200 PARTS PER HOUR!

Founded 1874—DESIGNERS and BUILDERS of MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS CO-PIONEERS WITH INDUSTRY OF ADVANCED METALWORKING PRODUCTION METHODS

NATIONAL MACHINERY CO.

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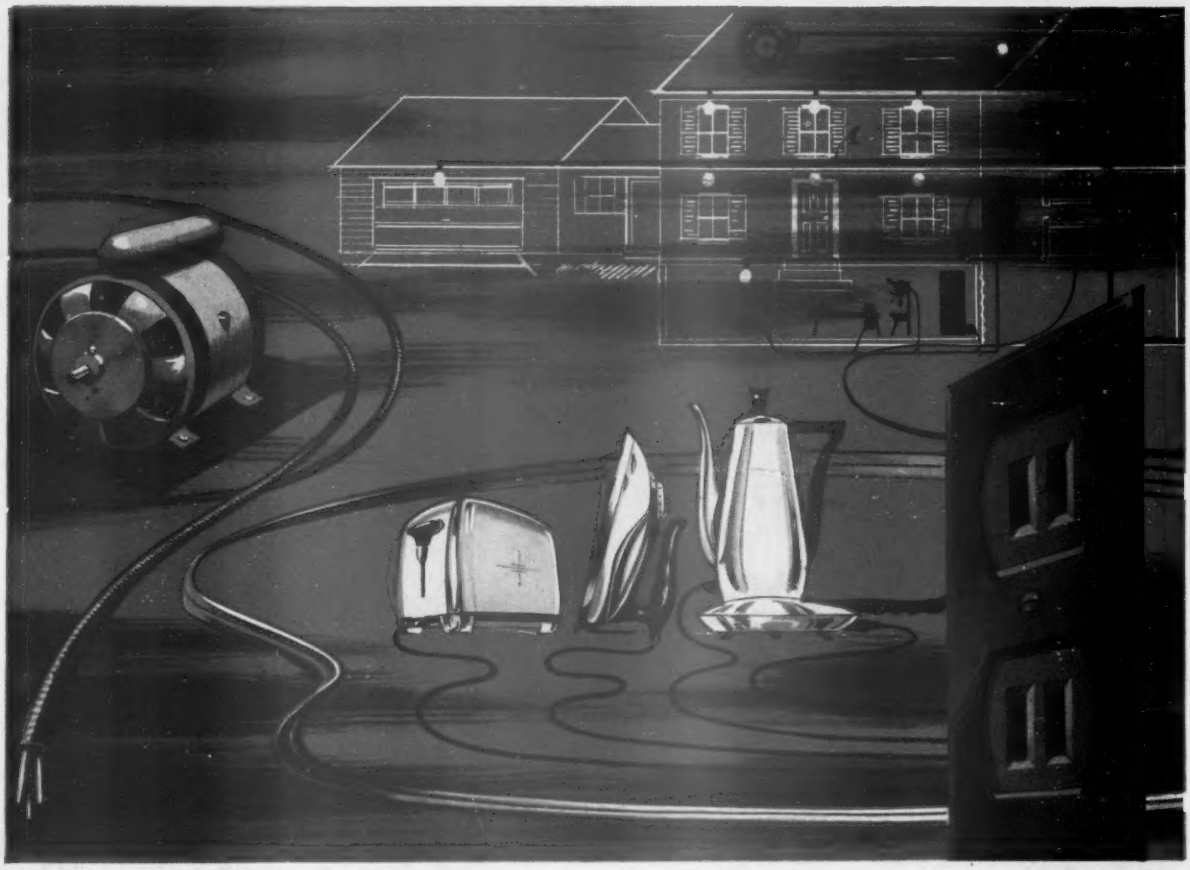
POLYVINYL CHLORIDE RESINS



four resins for electrical application

NAUGATUCK now offers the Wire and Cable Industry *more* PVC resins for insulation extrusion than does any other resin manufacturer.

Two of these Marvinol® resins, VR-22 and VR-23, have UL approval. These resins are, respectively, of high and intermediate molecular weight. Both have good dry blending properties.

Marvinol VR-24 and Marvinol VR-25 are resins of progressively lower molecular weights. They provide high volume resistivity in semi-rigid compounds with little or no plasticizer. Both deserve your careful evaluation for future electrical products.

Check with your Marvinol technical representative for complete data and evaluation samples, or write us on your firm's letterhead.

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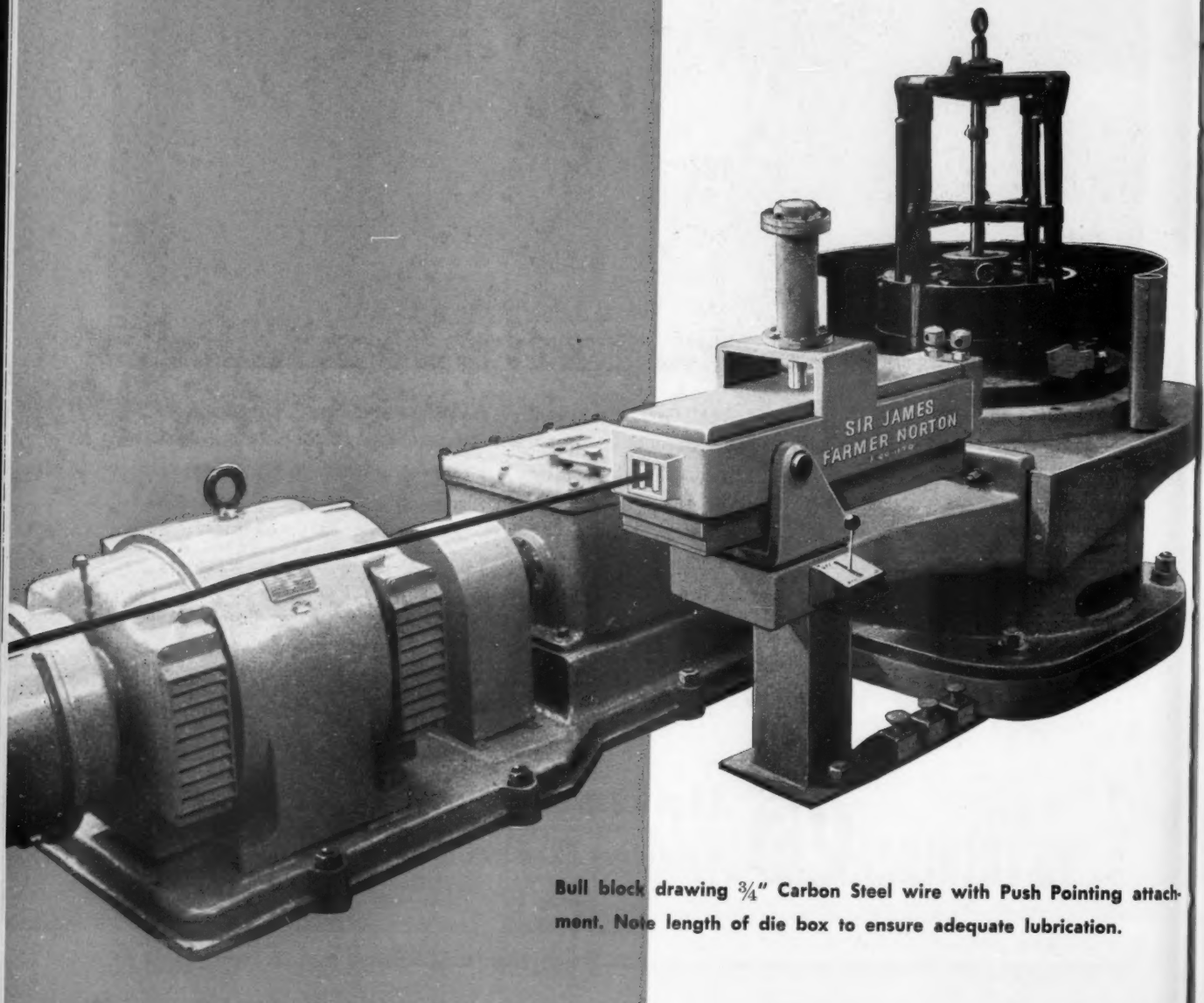
Farmer Norton

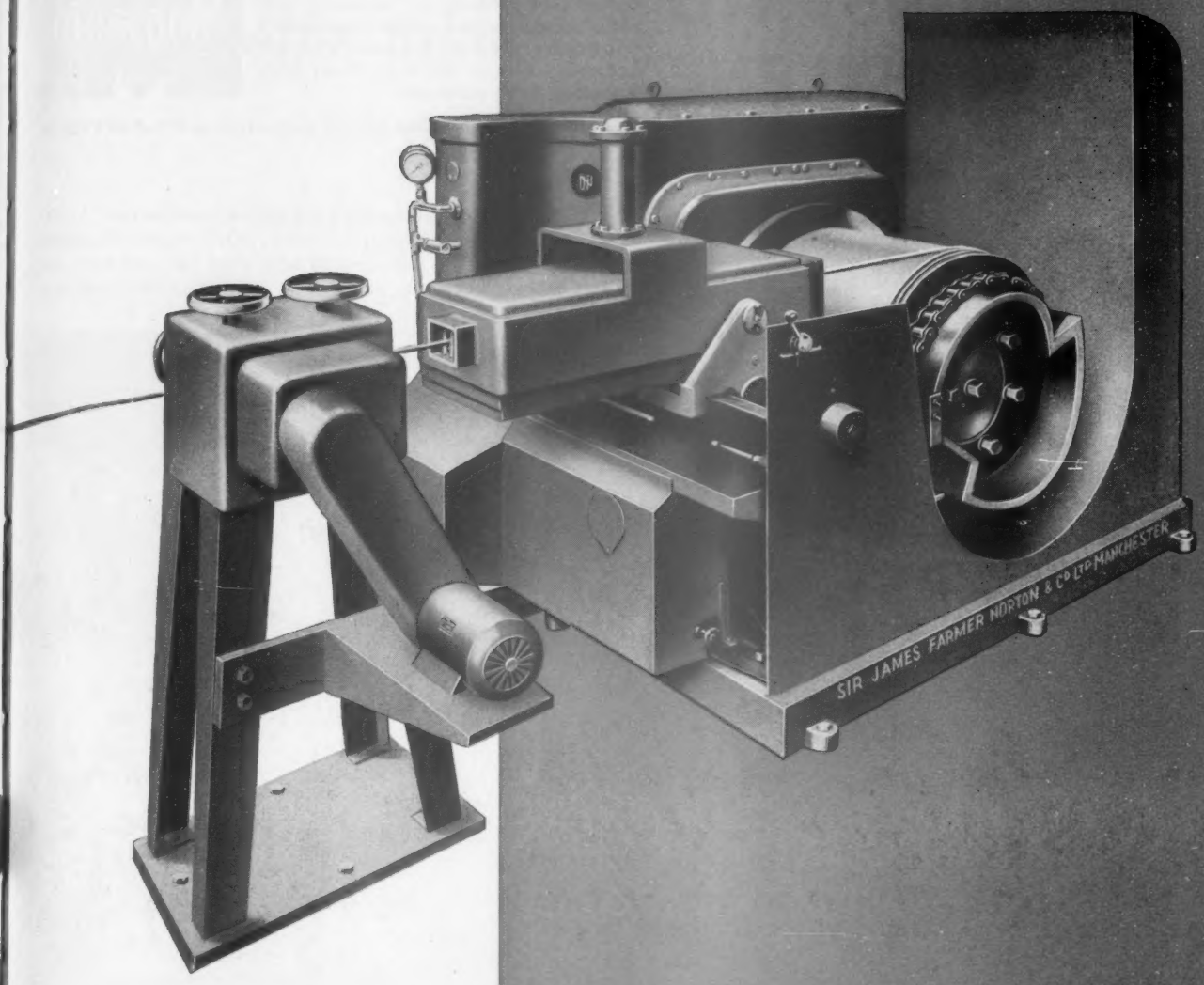
Push Pointing Units

for Wires from 1⅛" to ½" dia.

These Hydraulic Units can be fitted to practically any Bull block drawing heavy rods down to ½" diameter. The handling and pointing of heavy rods has always been a laborious and lengthy process. It is now possible to point and draw on the same machine. The Farmer Norton Push Pointing Unit straightens the first end and points the wire by driving it through the drawing die. The 'dog' may then be attached to the 'tag end' and drawing commenced.



Bull block drawing ¾" Carbon Steel wire with Push Pointing attachment. Note length of die box to ensure adequate lubrication.



Horizontal bull block for 1⅛" diameter Bolt Wire. 36" diameter block. 30ft /min. 80ft /min. 110ft /min. Straightening roll and push pointer supplied.

Sir James Farmer Norton & Co. Ltd.

ADELPHI IRONWORKS, ADELPHI STREET, SALFORD, 3. LANCASHIRE

TELEPHONE: BLACKFRIARS 3613/4/5

TELEGRAMS: 'AGRICOLA' MANCHESTER.

Why utility engineers now specify

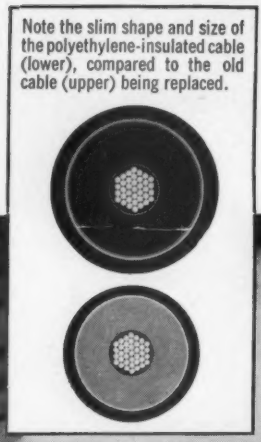
POWER CABLE INSULATED WITH MONSANTO POLYETHYLENE

• better abrasion resistance • lower power factor; less power loss in transmission • low surface tracking • excellent moisture resistance • less bulk, less weight

Leading manufacturers now produce power cable insulated with polyethylene based on Monsanto Polyethylene resins, specially developed and perfected by Monsanto. For complete technical data including applicator's information, write to Monsanto Chemical Company, Plastics Division, Room 730, Springfield 2, Massachusetts.

Monsanto®

MONSANTO ACTIVATOR IN **PLASTICS**

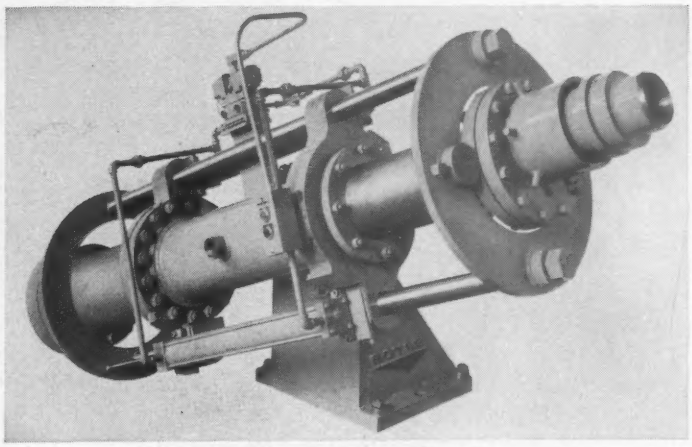


Note the slim shape and size of the polyethylene-insulated cable (lower), compared to the old cable (upper) being replaced.

New 15,000 volt polyethylene-insulated power cable installation at main sub-station, Monsanto Chemical Company, Plastics Division plant, Springfield, Massachusetts. Installation-rated at 175 amps, 15,000 volts. 3-phase system, 1 conductor per phase. Conductors are 133,100 circular mil copper, with 37 strands. Insulation consists of: 1 layer black fiberglass tape, 297 mil polyethylene insulation, metal shielding, 6/64" vinyl jacketing.

ROYLE

helps take the problems out of high voltage cable production



Another "first" for the Wire Industry from Royle is the complete, new Royle line of Splice Boxes for Vector* and conventional CV. Pneumatically powered Royle Splice Boxes will cut down-time costs and speed up operations.

Vector* Splice Box

If high voltage cable is creating production problems for you, Vector* CV could prove to be the answer. Vector* CV has shown its production ability day in and day out—with large and small cable—long and short lengths.
All types are economically produced with versatility, full cycle vulcanization and pressure cooling at speeds usually associated with horizontal CV.

Royle patented Auxiliary Seal assures economical production of short length cable.

Royle Auxiliary Equipment:

Engineered Capstan Systems
Splice Boxes
Roller Feed Hoppers
Take-Ups
Vulcanizing Tubes (conventional and catenary)
Pressure Cooling Systems
Pump and Seal Assemblies

Call your Royle Engineer—have him design a Vector* CV tailored to your specific requirements . . . all without extensive—and expensive—building alterations.

**Patented*

ROYLE
Paterson, N. J.

JOHN ROYLE & SONS

John Royle & Sons, 10 Essex Street, Paterson 3, New Jersey
Pioneered the Continuous Extrusion Process in 1880

Home Office, V. M. Hovey, J. W. VanRiper, SHerwood 2-8262. **Akron, Ohio,** J. C. Clinefelter Co., BLackstone 3-9222. **Downey, Cal.,** H. M. Royal, Inc., TOpaz 1-0371. **London, England,** James Day (Machinery) Ltd., Hyde Park 2430-0456. **Tokyo, Japan,** Okura Trading Company, Ltd., (56) 2130-2149.

CF&I Heavyweight Shaped Coils

PACKAGED for YOUR PRODUCTION

Mr. Marwil points out in-plant handling and unloading is more efficient and economical with CF&I Shaped Coils than with mill coils. Shaped coils can also be stored more compactly.

give long production runs at Marwil Products Co.

With a 12 million unit annual capacity, Marwil Products Co., Fort Loramie, Ohio, is rated as the largest U. S. manufacturer of muffler clamps and U-bolts. Nine months ago the company switched to CF&I Wire. Mr. William Marwil, Vice President tells why:

"We find CF&I's 2000 lb. shaped coils of clean, bright basic wire are very uniform, with no 'thin' areas or rough finish. These large coils give us longer runs without the necessity for frequent set-ups on our Lewis Cut Off machines."

In addition to the high quality of CF&I Wire, new packaging methods have increased the preference for CF&I Wire.

Replacing small, light-weight coils are CF&I Shaped Coils and spiders. The spider, leased from CF&I, acts like a spool, and pays off the wire evenly and smoothly. Now, instead of losing hours of production time every day in changing small coils or unravelling tangled wire, *one* CF&I Shaped Coil can usually last many hours. The shaped coils and spiders make for easier handling and storage, too.

One of our salesmen will be glad to recommend the right "package" to increase your production and cut manufacturing costs. You can call your nearest CF&I sales office today and arrange a "no obligation" visit.

CF&I-WICKWIRE WIRE

THE COLORADO FUEL AND IRON CORPORATION

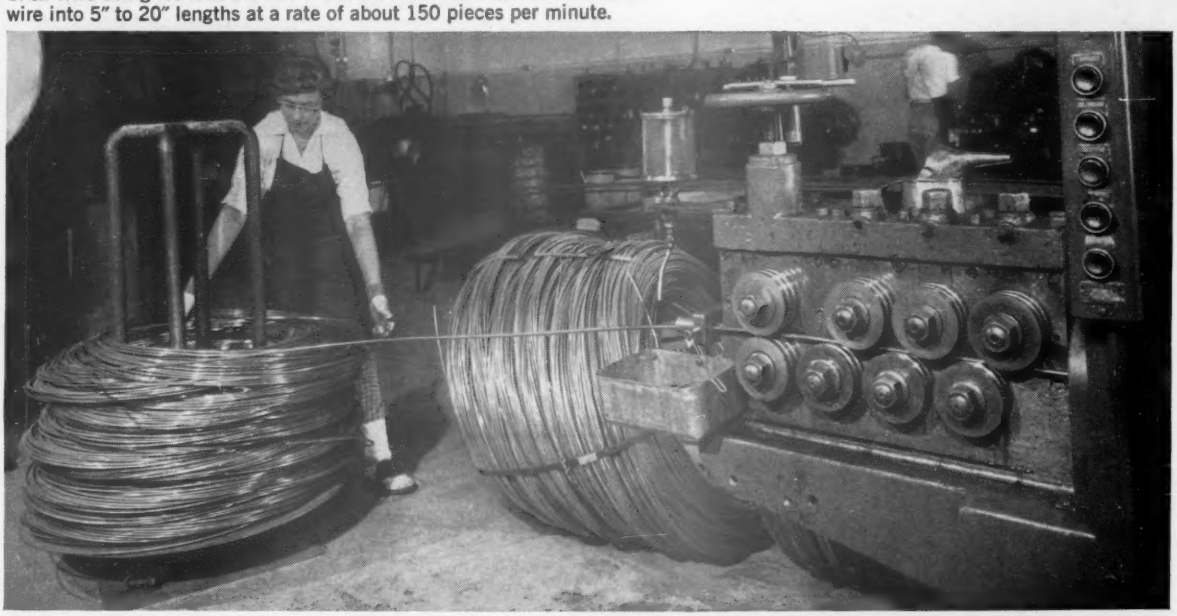
7346

In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Farmington (N. M.) Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco San Leandro • Seattle • Spokane • Wichita

In the East: **WICKWIRE SPENCER STEEL DIVISION**—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

CF&I OFFICE IN CANADA: Montreal • **CANADIAN REPRESENTATIVES AT:** Calgary • Edmonton • Vancouver • Winnipeg

CF&I Wire being fed into the Lewis Cut Off machine. This machine cuts wire into 5" to 20" lengths at a rate of about 150 pieces per minute.



It is early, but NOW is the time to plan for

YOUR ATTENDANCE AT

THE ANNUAL CONVENTION

of

THE WIRE ASSOCIATION

THE DATES: November 14-17, 1960

THE CITY: Chicago, Illinois

THE PLACE: La Salle Hotel

Four full days of technical papers, good fellowship, plant visitations and other features that will make your Convention memorable.

Complete and separate, simultaneously held technical sessions will offer excellent presentations of papers for the following divisions:

FERROUS
NON-FERROUS
ELECTRIC WIRE & CABLE

Plant Tours of Western Electric Company's Hawthorne Works and Republic Steel Corporation's South Chicago Wire Mills have been arranged. Much that is new will be seen since our last visits some years ago.

All wire men are invited to attend
The 1960 Convention in Chicago.
Won't you arrange now to attend?
Full details will be published later.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

453 MAIN STREET **STAMFORD, CONN.**

THE NEW LEWIS Convertible*

AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINES WITH VARIABLE SPEED DRIVE AND DUAL-CENTER STRAIGHTENER ARBOR

Front View No. 2CV4 ... Capacity 1/16" to 1/4" diameter. (No. 2CV5 capacity 1/16" to 5/16" diameter.)

* The new Lewis No. 2CV series is equipped with our Dual-Center Rotary Straightener Arbor and can be quickly converted to handle shapes by installing our interchangeable Roll Straightener.

This convertible feature introduces a new flexibility in wire straightening and cutting operations ... one machine can serve a double purpose in your plant. Higher production with greater accuracy is achieved through the use of a Variable Speed Drive which permits the correct feed speed (up to 200 FPM) for all requirements.

The outstanding feature of this series is the DUAL-CENTER STRAIGHTENER ARBOR (Pat. Pending) for round wire. This feature increases the range of the machine and makes it possible to precision straighten small diameters below the capacity of other machines.

Other models available to handle .012" to 1" diameter, as well as shapes.

THE LEWIS MACHINE COMPANY

3441 East 76th Street • Cleveland 27, Ohio • A Division of Curtis Mfg. Co.

At Last! FULL AUTOMATION

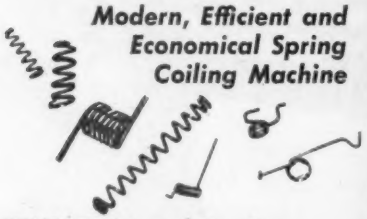
with

WAFIOS

AUTOMATIC

SPRING COILING MACHINE

Modern, Efficient and Economical Spring Coiling Machine

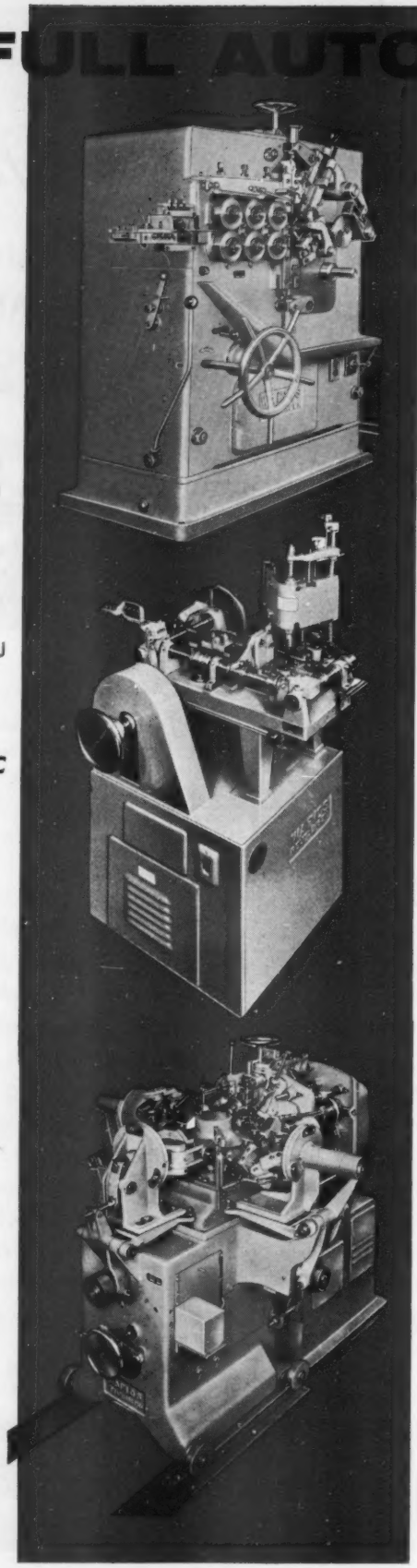


SFMU Universal Torsion SPRING COILING AUTOMATIC

This machine has been designed to eliminate expensive hand operation when manufacturing Torsion Springs with shanks having complex bends. It is possible to form complex shaped shanks with relatively simple tooling. This new series is available in three sizes with or without four bending slides to offer an extensive variety of applications. This series can handle wire diameters ranging from .008" to .177".

Series "ZO" Automatic Extension SPRING COILING and LOOPING MACHINE

The ZO permits the manufacture, untouched by hand, of right hand extension springs with loops at both ends. The loops may have any desired position relative to one another, and one loop end may be completely different in shape or position from the other. It is capable of producing up to 48 finished pieces per minute with loops on both ends. The ZO is available in 2 sizes for wire diameters ranging from .020" to .118", and springs from ⅜" to 8" long.



Model FM Automatic SPRING COILING MACHINE

This machine is unequalled for high production capacity, exact infinitely variable wire length regulation, and quiet operation. It is capable of handling different wire feed speeds. Almost all compression and tension springs can be mass produced with the FM series. There are five types available; — FM 4, FM 8, FM 15, FM 30, and FM 50. Capable of handling wire with diameters ranging from .004" to .197".

Complete specification bulletins are now available for each series. Write for complete information to:

WAFIOS

MACHINERY CORPORATION

61 HUDSON STREET
HACKENSACK, NEW JERSEY
Tel. HU 9-7577

WAFIOS MASCHINENFABRIK
Wagner, Ficker & Schmid

REUTLINGEN/WURTT., GERMANY

QUALITY

begins with

KEYSTONE WIRE

GARDNER WIRE CO.

of Chicago manufactures millions of wire springs for such diverse industries as home appliances, controls, automobiles and toys.

For 20 years Gardner has used Keystone MB Spring Wire on such applications as the cord protector spring illustrated above. This particular spring has five different dimensions—each must be held to tolerances of ±.0005". Special cams to make this part are hand ground. Control of dimensions in a spring wire, especially a wire with superior performance characteristics like Keystone's MB, builds a better end product and allows faster runs at lower cost. Production interruptions are virtually eliminated. Keystone product uniformity also assures spring makers that their product will perform exactly as calculated over a long life. Keystone MB is shipped clean—takes plating reliably.

Your Keystone representative is a wire specialist. Consult him for the correct wire to improve your product and your reputation for quality.

Hundreds of spring sizes and shapes are produced at Gardner from Keystone MB Spring Wire.

Keystone Steel & Wire Company, Peoria 7, Illinois

KEYSTONE

WIRE FOR INDUSTRY

COILER!

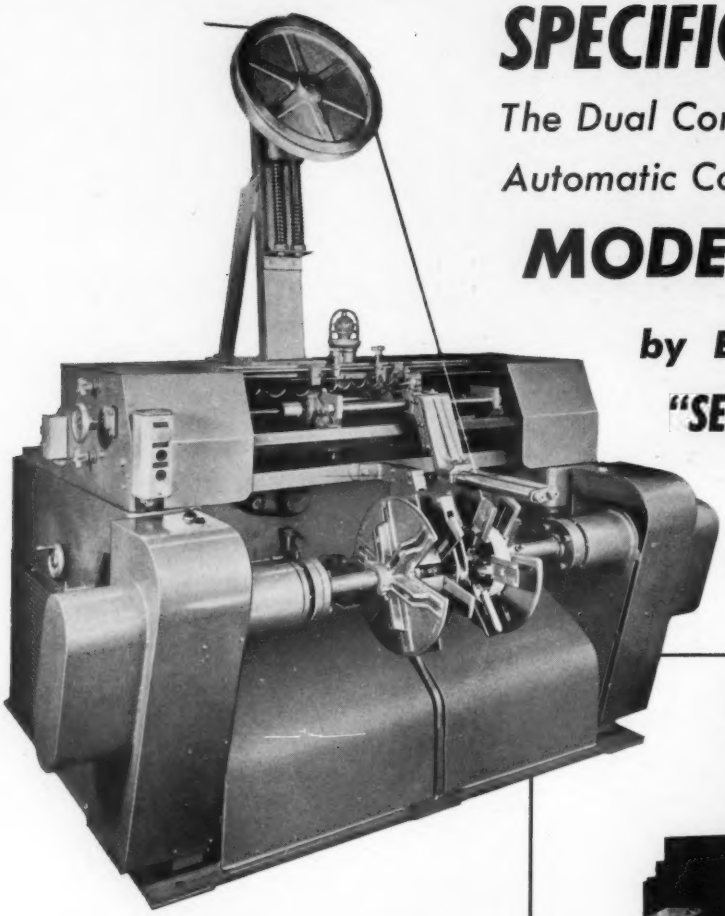
SPECIFICALLY

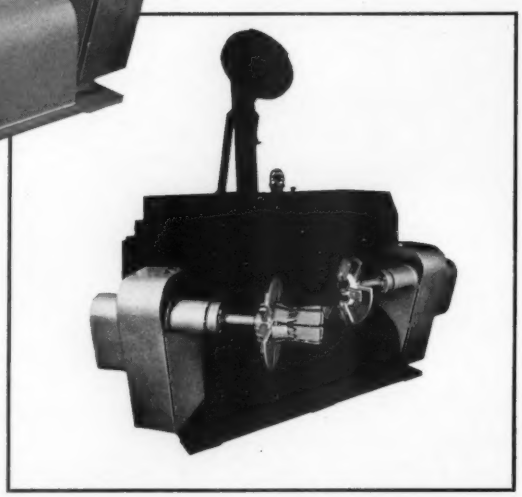
The Dual Continuous
Automatic Coiler

MODEL TC-24

by ENTWISTLE

"SENSIBLE LINK TO AUTOMATION"





EVEN MORE SPECIFIC

Are the savings you can realize from reduced handling and space requirements, through elimination of the secondary coiling operation.

SENSIBLE —

Because the modernization to Continuous Coiling is accomplished without further changes to the existing extrusion equipment.

Produce and package in one operation.

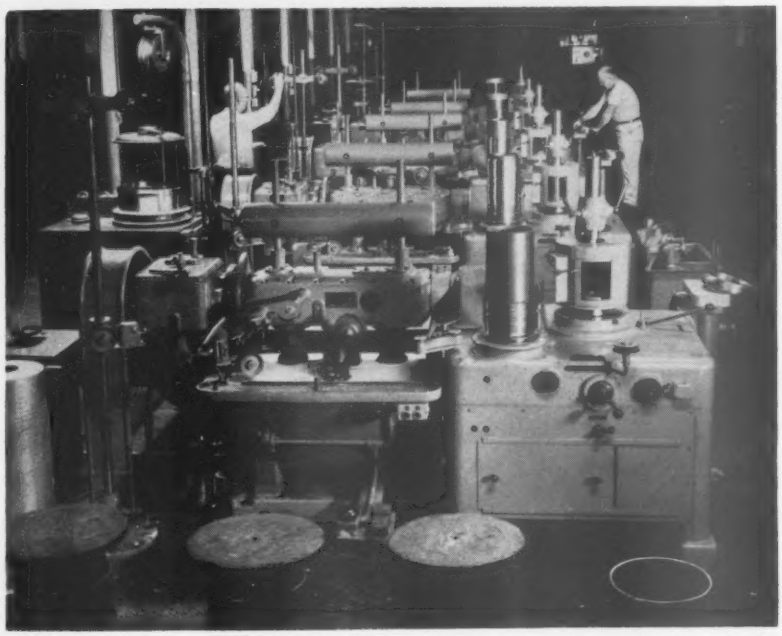
ASK FOR SPECIFICATION #5H

ENTWISTLE
Manufacturing Corporation
1475 ELMWOOD AVE., PROVIDENCE 7, RHODE ISLAND
Over 40 years of dependable service
Formerly James L. Entwistle Co.

Europe, South America, Mexico
FOREL EQUIPMENT CORPORATION
165 Broadway, New York 6, N. Y.

British Associates
THE KEMSON ENGINEERING CO., LTD.
Wellington Mill, Bolton Road
Blackburn, Lancs., England

BEFORE: Here, wire is being drawn "the old fashioned way."



AFTER: Shiny and new, with the look of tomorrow, the new wire drawing equipment at Prentiss produces wire better and faster.

NEW WIRE MACHINES UP PRENTISS OUTPUT

Five new wire drawing machines have been installed at Prentiss Wire Mills, Riverside-Alloy Metal Division, according to J. R. Fuller, manager of Prentiss. The new high-speed equipment has replaced ten rows of antiquated single hole tub drawing benches.

The new wire drawing machines are now in production and have drawn wire down to .008 inches diameter, only slightly thicker than a human hair, maintaining extremely close tolerances. They will be used to draw all types of wire including nonferrous alloys and high and low carbon steels.

After drawing, the machines automatically wind finished wire on spools or cores with capacities from 10 to 60 pounds, or in coils. Increased spool capacity pays off for customers by permitting longer uninterrupted production runs.

A number of new specialty wire products are now practical with the precision, high-speed equipment which constitutes the latest step in the continuous modernization of Prentiss Wire Mills.

"PRENTISS" adds "HERBORN" Wire Drawing Machines To Their Line

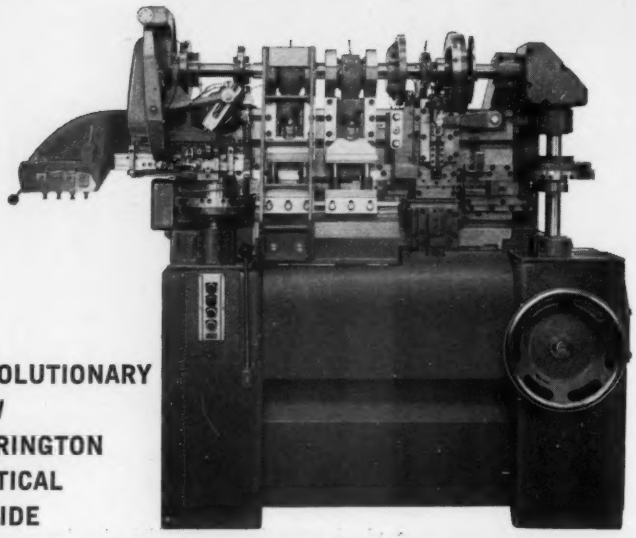
"HERBORN" TF IIIc Wire Drawing Machines photographed at the plant of Prentiss Wire Mills, Riverside Metal Alloy Division, H. K. Porter Company, Inc., at Holyoke, Massachuetts.

***Photos and text courtesy "Re:Porter," published monthly by H. K. Porter Company, Inc.**

Please send your inquiries to:

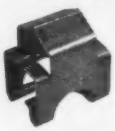
MASCHINENFABRIK HERBORN BERKENHOFF & DREBES A.-G. **HERBORN/DILLKREIS** GERMANY

HERBORN MACHINERY CORPORATION, 61 Hudson Street HACKENSACK, N. J.



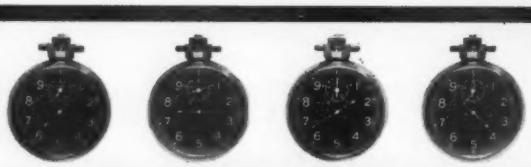
REVOLUTIONARY NEW TORRINGTON VERTICAL 4-SLIDE

PAID FOR ITSELF IN FOUR DAYS



PRODUCING THIS PART

Close-tolerance
enameling wiper die . . .
having 26 critical dimensions . . .
produced by General Electric
Industrial Heating Dept.



AT FOUR TIMES THE SPEED

With one machine
replacing five
progressively tooled OBI presses . . .
and producing the part
in one-fourth the time.

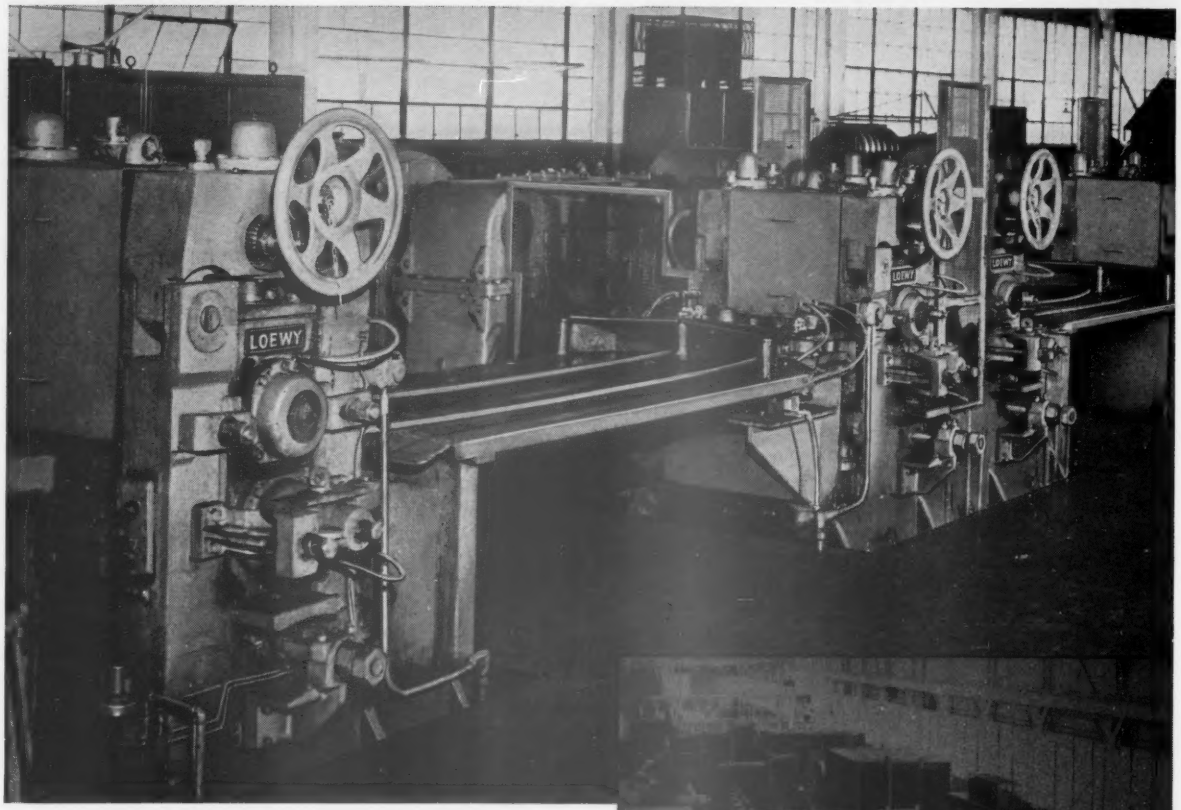
AND ONE-THIRD THE COST

Saving $13,500
on a single production run
of only three days duration!

This important new production tool, the Verti-Slide, offers sensational savings in direct and indirect labor costs, parts inventory, and floor space requirements . . . through elimination of secondary operations, drastic reduction in production man-hours, and lower tooling, down-time and materials handling costs. Write or call today for complete technical data . . . or a Torrington sales engineer.

THE TORRINGTON MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO

NOW! "LOEWY-COMPACT" MILLS for the economical production of copper wire rod



Loewy copper wire rod mill installation—part of 12 and 10-in. continuous finishing train showing entry side for 2-strand operation.

Overall view of 14-pass continuous Loewy wire rod mill

In 1955 Loewy introduced an automatic rolling installation for copper wire rod—a radical departure from the conventional layout. The Loewy concept differed fundamentally from the customary looping stand, which was serviced by tong men and required a considerable crew of highly skilled operators. Loewy has now taken another major stride.

The new "Loewy-Compact" mill features remarkable compactness and automation, optimum precision, and highly economical design. Heretofore it was considered uneconomical to roll smaller quantities of copper wire rod. The capital investment and the space requirements involved in a continuous wire rod mill seemed prohibitive for companies of limited size or those restricted in plant area.

Studies have demonstrated that wire rod in smaller quantities can be profitably produced on this new Loewy wire rod mill.

Avail yourself of our services in order to hold your own in the competitive market. Write Dept. I-5, outlining your requirements.

BALDWIN · LIMA · HAMILTON

INDUSTRIAL EQUIPMENT DIVISION • PHILADELPHIA 42, PA.

BALDWIN BLH LIMA-HAMILTON

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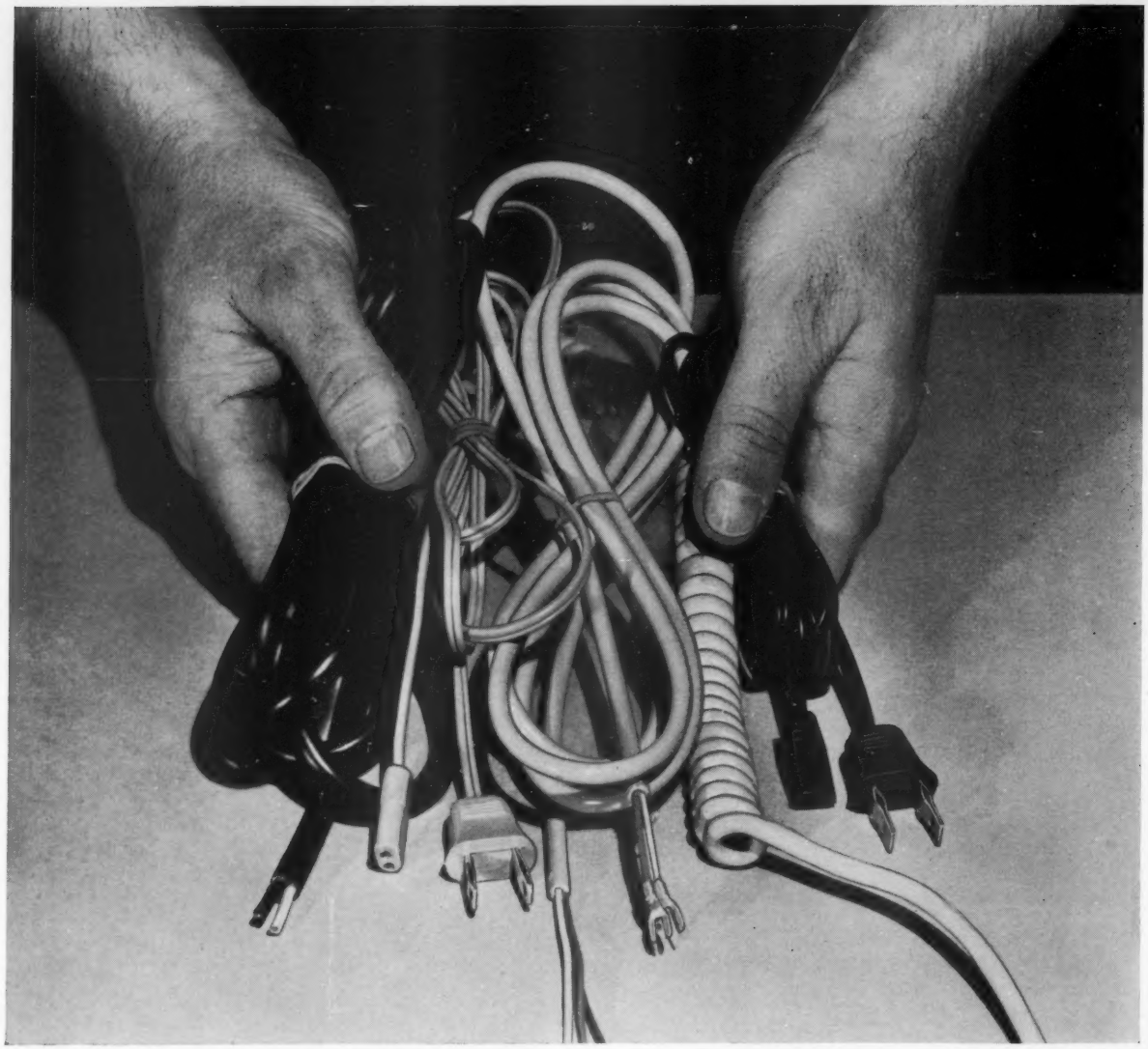


Need a quality resin accepted and approved for electrical applications?

VYGEN 120 PVC resin is UL-approved as interchangeable with other quality PVC resins for wire insulating applications. VYGEN 120 is specially formulated for fast economical dry-blend extruding, with monomeric or polymeric plasticizers. It assures a lack of gelled particles . . . provides excellent heat and light stability plus exceptionally long life. See how VYGEN can help your products . . . speed your production . . . send for complete technical literature today!

VYGEN®

VYGEN 85 — Recommended for calendering, extrusion and molding operations where processing at low temperatures is desired.

VYGEN 105 — For light embossed sheeting and for molded items and extrusions requiring high gloss finish.

VYGEN 110 — General purpose resin for calendered film, sheeting and coated fabrics . . . molding and extruding. Excellent heat and light stability.

Creating Progress Through Chemistry

Chemical Division GENERAL

THE GENERAL TIRE & RUBBER COMPANY
Chemical Division · Akron, Ohio

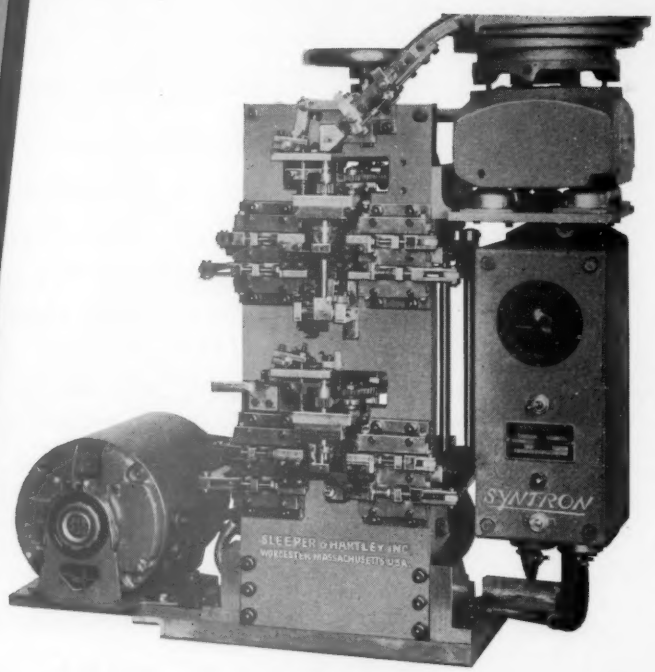
Chemicals for the rubber, paint, paper, textile, plastics and other industries: **GENTRO SBR** *rubber* **GENTRO-JET** *black masterbatch* • **GEN-FLO** *styrene-butadiene latices* • **GEN-TAC** *vinyl pyridine latex* **GENTHANE** *polyurethane elastomer* • **ACRI-FLO** *styrene-acrylic latices* • **VYGEN PVC** *resins* • **KURE-BLEND** TMTD *masterbatch* • **KO-BLEND** *insoluble sulfur masterbatch*

A NEW MACHINE THAT PAYS FOR ITSELF IN SIX MONTHS . . .

NEW
S & H #0
AUTOMATIC
SPRING LOOPER
Series #750

Here is the most revolutionary designed looping machine to hit the spring industry in years. It enables you to loop your extension springs five to six times faster than with conventional methods. Hopper fed, it loops both ends of extension springs in one operation.

Time consuming set-up procedures, usually encountered with Automatic Coiling-Looping Combinations are eliminated, saving time, labor and money. Length Range — ¼" to 1½"; Max. O.D. — .200; Wire Range — .010 to .025; Production — 3000 springs per hr.



Write for further information

SLEEPER & HARTLEY INC.
335 CHANDLER STREET
WORCESTER 1, MASS., U.S.A.
ORIGINAL MANUFACTURERS OF UNIVERSAL SPRING COILERS

Where can I find it?

Look in the BUYERS' GUIDE for your answer

DO YOU have a copy of the 1960 WIRE AND WIRE PRODUCTS BUYERS' GUIDE on your desk for ready reference when you need it?

The 1960 Edition contains literally Thousands of changes — of names, addresses, products, etc.

It will tell you quickly who manufactures all kinds of wire machinery, equipment and supplies; who makes different kinds of rods, bars, wire, wire products, strip, billets; and who produces various types of electric wire and cable.

In addition, in the Year Book section, it gives you:

HISTORY OF WIRE ASSOCIATION ACTIVITIES IN 1959

CONSTITUTION AND BY-LAWS OF THE ASSOCIATION

OFFICERS, DIRECTORS AND COMMITTEES FOR 1960

LISTS OF ASSOCIATION MEMBERS BY INDIVIDUALS AND COMPANIES

INDEX TO ARTICLES AND SUBJECTS PUBLISHED IN WIRE AND WIRE PRODUCTS IN 1959

LISTS OF AWARDS PRESENTED FOR MERITORIOUS PAPERS

Every wire man needs this new BUYERS' GUIDE. It is the only directory in the U.S.A. published exclusively for the Wire Industry—a real gold mine of information!

PRICE: $5.00 EACH; $3.00 TO SUBSCRIBERS TO WIRE AND WIRE PRODUCTS. PUBLISHED MAY 1st.

Order the Revised 1960 Edition Today from

WIRE AND WIRE PRODUCTS

453 MAIN STREET

STAMFORD, CONNECTICUT

WHITACRE 22″ WIRE DRAWING DEAD BLOCK

Continuous Production—Efficiency Approaching 100%

Gives you these advantages

Continuous increased production achieved by: • No down time for stripping • Permits packaging into stationary container or uninterrupted palletizing on stems • No tangling nor snarling from handling • Design simplicity. No back-gearing nor similar mechanisms • Greatly reduced floor space requirements • Dies in supplying drawing machine can be changed without stopping dead block • Accumulation type machines can be "run down" without stopping dead block • Continuous inspection and sampling • Breaks welded in production — low scrap loss • Increased production with lessened operator fatigue • Maintenance eliminated except for occasional lubrication of four main bearings and two motor bearings • Dead block can be located anywhere with wire literally piped from wire drawing machine • Extra large packages for in-process wire • Greatly reduced handling and in-plant transportation costs • Low capital investment.

OTHER MODELS AVAILABLE

16″ Wire Drawing Dead Block, Model DB-16A • 26″ Wire Drawing Dead Block, Model DB-26A • Combination 16″ and 22″ Galvanizing or Tinning Dead Block Take-ups, Model GB-2216A • 26″ Heavy Wire Galvanizing or Tinning Dead Block Take-up, Model GB-26B.

Write Today For Specifications And Name Of Nearest Distributor

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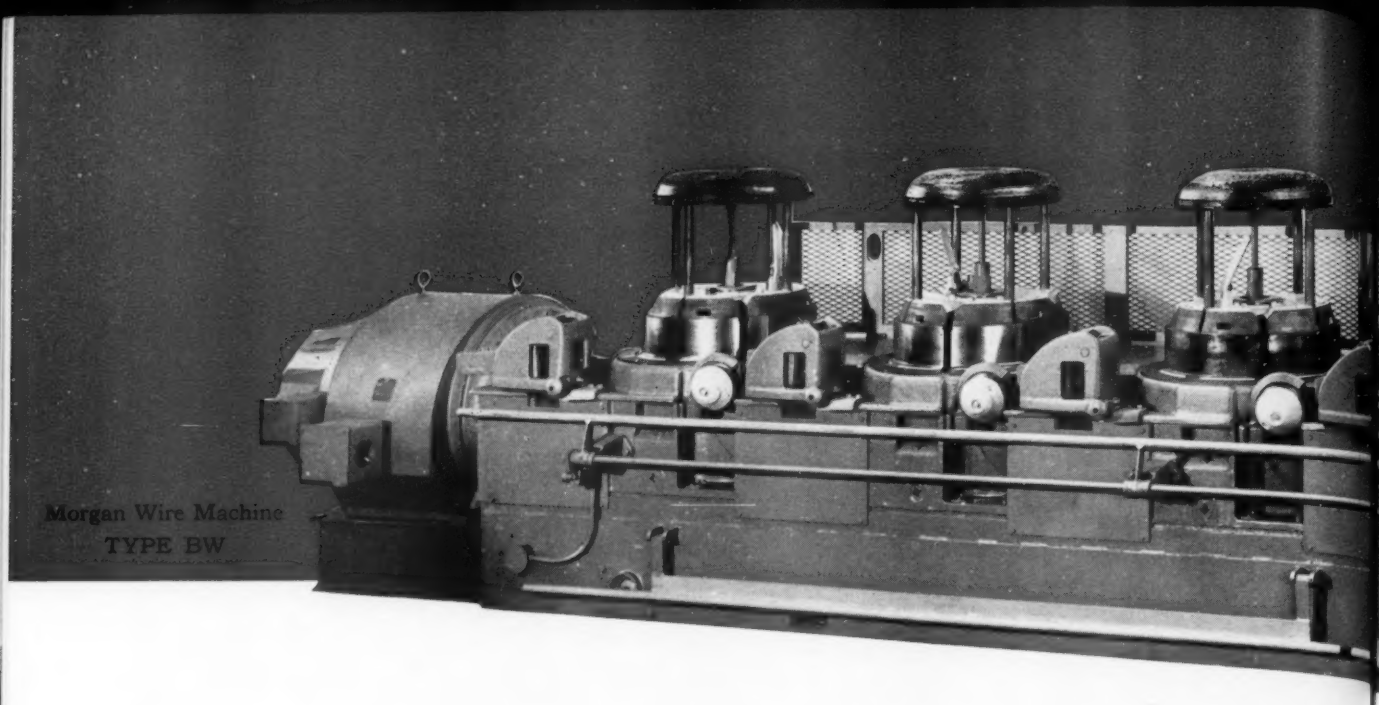
WHITACRE



Morgan Wire Machine
TYPE BW

for top quality production, it

MORGAN WireD

COMPACTNESS
Compact design means high production per floor unit.

LARGE BUNDLES
Efficient design permits high speed production of heavyweight bundles.

QU
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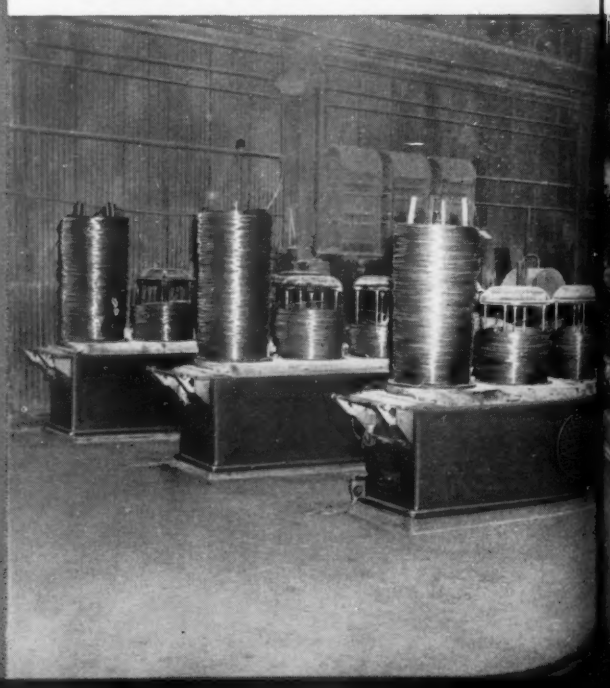
at



on, it pays to specify:

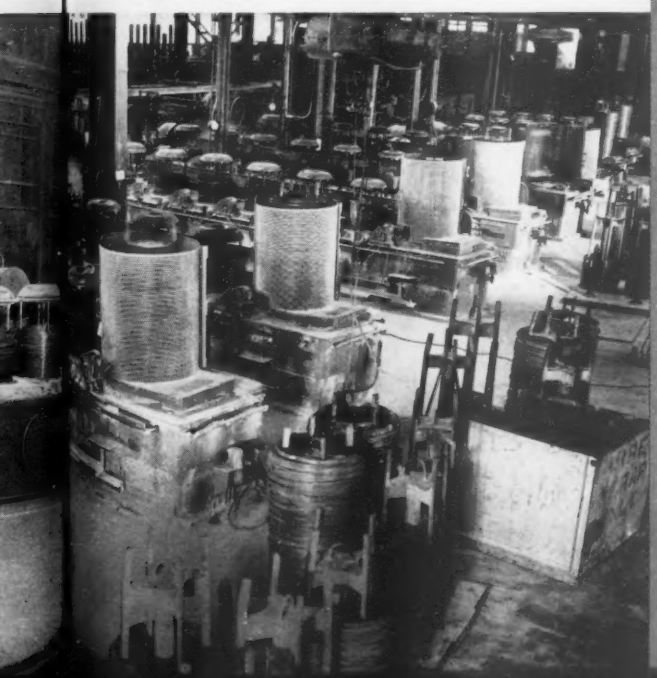
e Drawing Machines

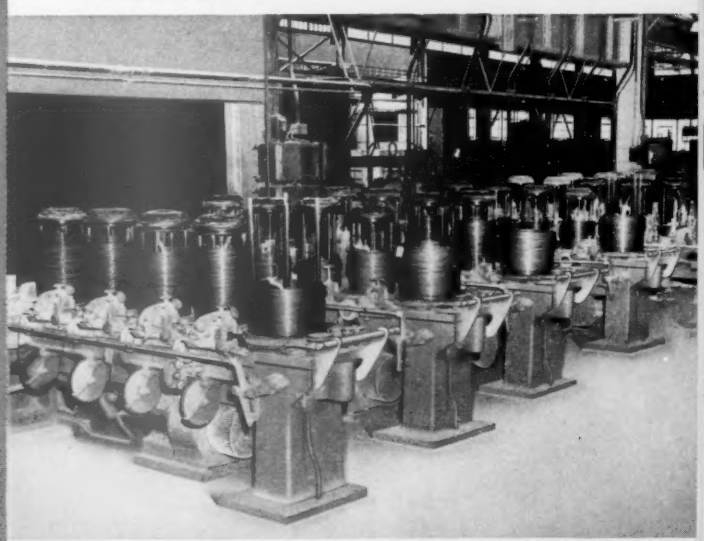
QUALITY

Critical physical standards can be met because of *rapid* air cooling when drawing at high speeds.

ECONOMY

You will save with Morgan Wire Machines' low power cost and low die cost per ton of wire drawn.





MORGAN CONSTRUCTION CO.
WORCESTER, MASSACHUSETTS

WM-121

MIYAZAKI

Series 1

New! Improved! Fast!

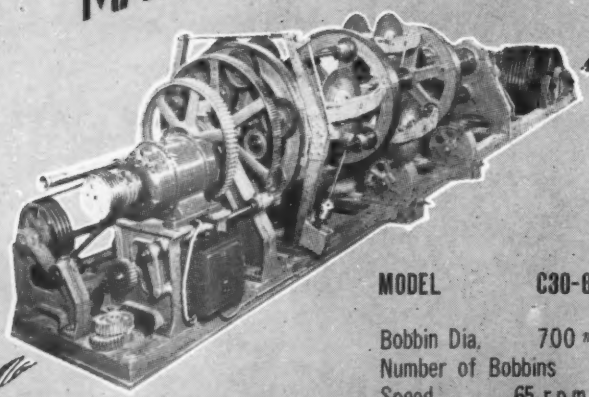
Machinery for Wire Rope & Cable

TUBULAR TYPE STRANDING MACHINE

MODEL S24-6B

Bobbin Dia. 600 m/m
Number of Bobbins 6
Speed 800 r.p.m.

CLOSING MACHINE



MODEL C30-6F

Bobbin Dia. 700 m/m
Number of Bobbins 6
Speed 65 r.p.m.

MIYAZAKI can supply .....

*WIRE STRANDING MACHINE
(Tubular or Planet Type)
*CLOSING MACHINE
BUNCHING MACHINE
ASSEMBLING MACHINE
WINDING MACHINE
PATENTING TAKE-UP FRAME
GALVANIZING TAKE-UP FRAME
CONTINUOUS WIRE DRAWING MACHINE
(Cumulative or Straight-Line Type)
COILER BLOCK (With or Without a Die)
BULL BLOCK
SPOOLER
POINTING MACHINE etc. .....

MIYAZAKI IRON WORKS, LTD.
KAIZUKA, OSAKA, JAPAN.

When it comes to oil tempering of wire

.....Lee Wilson

gives it to you straight

If your business includes steel oil tempered spring wire, you will be interested in Lee Wilson's continuous heat treating equipment for hardening and tempering this material. Especially accurate temperature control in the radiant tube fired settings, and with an oil quenching system to provide accurate and uniform quenching temperatures, the wire will develop physical properties to be within 175,000 and 200,000 P.S.I. with a camber tolerance of ½″ in 5′0″. The first unit of this design is in operation producing 2500# per hour of spring wire from .075″ to .500″ in diameter.

Lee Wilson* ENGINEERING COMPANY, INC.
20005 LAKE ROAD • CLEVELAND 16, OHIO

HIGH CONVECTION ANNEALING FURNACES
MAKE THE BEST METALS BETTER

*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FURNACES

Burroughs' Unique Tests and Johnson Wire Build Quality, Long Life in Business Machines

Detroit Plant Develops Own Devices For 100% Tests of Music Wire Springs

Burroughs Corporation demands music spring wire as thin as a spider web's strand but with a minimum tensile strength of 439,000 pounds per square inch.

Then—to make sure it gets what it orders—the Detroit business machine manufacturer does 100 percent testing of all wire coming into its plants. Burroughs goes further than standard test equipment would permit and has developed its own special testing devices.

Burroughs' insistence on enforcing specifications is the kind of quality challenge on which Johnson Steel & Wire Company thrives. A customer's emphasis on quality wire complements Johnson's own skill and care given to producing the best in specialty fine wires.

Precision springs, made from Johnson Steel & Wire Company's music spring wire, get 100 percent testing on unique testing machines like this. Designed and built by Burroughs, this machine verifies a spring's load-carrying capacity at various extensions. If any modification is needed, correction can be made while spring is still on test device.

Johnson Steel & Wire has become Burroughs' major music spring wire supplier because Johnson's wire passes 100 percent inspection with flying colors.

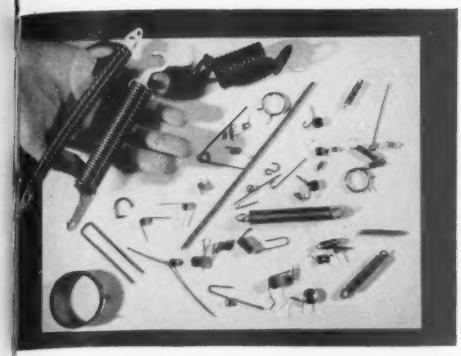
At Burroughs, where a monthly production of 3½ million precision springs of music wire is not unusual, close attention must be given to everything affecting performance of the finished spring. Failure of even the simplest spring could disable an adding machine, cash register, calculator or any of the dozens of different business machines Burroughs makes.

For its new machines, as well as service parts for older models, Burroughs makes 1,300 different kinds of springs. Music wire required for them ranges from .005-inches in diameter (with minimum tensile strength of 426,000 psi) to the largest diameter used—.106 inches in diameter, (with a minimum tensile of 268,000 psi).

Here's what Burroughs wants from music spring wire, in addition to tensile strength:

The coating, in the case of tin-coated music spring wire, must be uniform and adherent to eliminate peeling, cracking or flaking during coiling.

- **High physical qualities,** uniform cast and smooth, lustrous surfaces are another must so that uniform springs, within dimensions and capable of carrying assigned loads, can be produced.
- **Accuracy of dimensions** greatly affects spring coiling and spring performance. Burroughs' tolerance specifications are met consistently by Johnson's wire.
- **Straightness requirements** for pre-straightened wire call for a three-foot length of wire cut from a



Here's some of the approximately 1,300 different kinds of springs which Burroughs Corporation manufactures from Johnson Steel's music spring wire.

Several hundred music wire springs have been installed in this portable Burroughs adding machine. Every spring is critical, says Burroughs, because even the smallest spring failure could disable the machine.

coil to be straight within 4 inches for .013-inch diameter wire and straight within 3 inches for wire .014-inch diameter and larger.

• **Coilability** is assured in the music spring wire Burroughs buys. Burroughs specifies that wire (.105 inch in diameter and smaller) must meet this test:

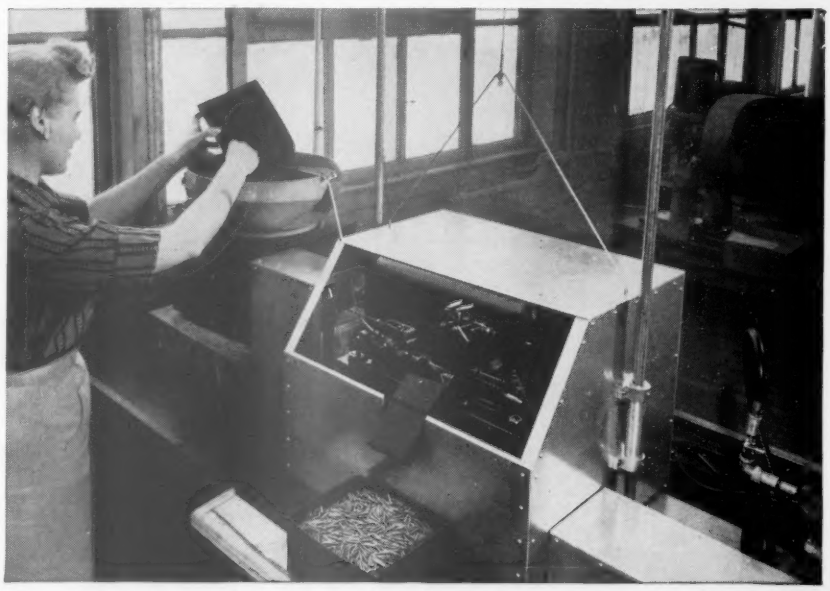
Wire is wound in a tightly closed spring to a coil length of 5 inches on an arbor 3 to 3½ times the diameter of the wire. When this spring is stretched so that it sets to 3 times its original length, the coils must show a uniform pitch with no splits or fractures in the wire.

Testing completes the cycle which calls for highly skilled technicians coiling the best music spring wire available on the most modern equipment.

Testing machines, designed and built by Burroughs and used in addition to the standard machines, include the test fixture pictured here. This machine tests load-carrying capacity of springs. If any corrections are needed, they can be made while the spring is still on the test device.

Burroughs' careful attention to specs, its quality control and its testing procedure—plus its confidence in Johnson's music spring wire—are proof that Johnson can meet the toughest music wire demands.

Putting Johnson's music spring wire on your production lines starts benefiting you immediately. A corps of skilled wire engineers is as close as your telephone. Get in touch today with any of the district sales offices listed at right.



This automatic spring eye-forming machine was designed and built by Burroughs personnel. An operator is shown filling the hopper with coiled springs which will be given an eye at each end on this device.

Johnson Steel & Wire Company, Inc.

Worcester 1, Massachusetts

a subsidiary of **Pittsburgh Steel Company**

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

Atlanta	Cleveland	Detroit	Los Angeles	Pittsburgh
Chicago	Dayton	Houston	New York	Tulsa
			Philadelphia	Warren, Ohio

WIRE and WIRE PRODUCTS

reaches many prospects

YOUR SALESMEN DON'T KNOW!

No matter how big you are, the odds are you don't know all your actual prospective customers.

If your company is small, it is even more important to be "calling" on your prospects and customers regularly through advertising.

Your advertising in Wire and Wire Products will be seen by many people in the plants you wish to "sell", whom your salesmen never would see, yet who specify, actually buy or who influence decisions on products to be purchased. Your advertising is bound to be of immeasurable value to you, too, in paving the way for a good reception for your salesmen when they do call. And the field's buying power is tremendous!

WIRE AND WIRE PRODUCTS circulation is all paid. We have no agents, offer no premiums or make special inducements to get circulation, except the value of the editorial contents in itself—yet our renewals have averaged 97% *or better for many years. That's why it is* a good and forceful advertising medium for all concerns who have products to sell to this vigorous and progressive industry.

———— • ————

Subscribers by Types of Mills in the Industry

1. Rod, Bar and Wire (producers of rod, bar and wire in all metals and shapes)	38%
2. Forming and Fabricating Plants (mfrs., largely from purchased wire, of springs, wire cloth, bolts, nuts, screws, rivets, wire forms, fences and fencing, wire specialties, wire rope and electric wire and cable)	59%
3. Miscellaneous—Libraries, Research Organizations, Jobbers, Distribution, etc.	3%

Subscribers by Types of Positions Held

1. Executives: Presidents, Vice Presidents, Secretary-Treasurers, Purchasing Agents, Sales Managers	22%
2. Operating: Vice Presidents, General Managers, Works Managers, Superintendents and Assistant Superintendents.	58%
3. Research and Maintenance: Plant Engineers, Metallurgists, Laboratory Technicians, Foremen and Inspectors	19%
4. Libraries	1%

———— • ————

• GET YOUR SHARE OF THE BUSINESS.....

• ADVERTISE IN WIRE AND WIRE PRODUCTS.....

• SEND FOR ADVERTISING RATES TODAY.....

WIRE and WIRE PRODUCTS

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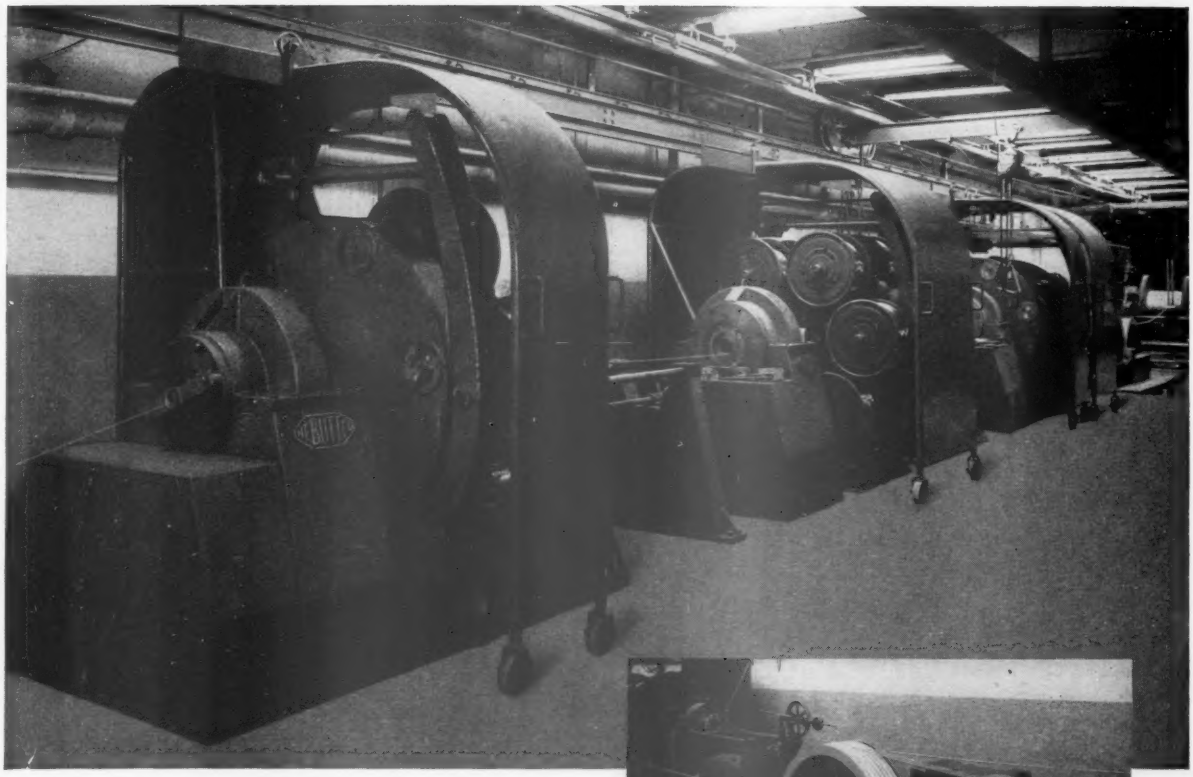
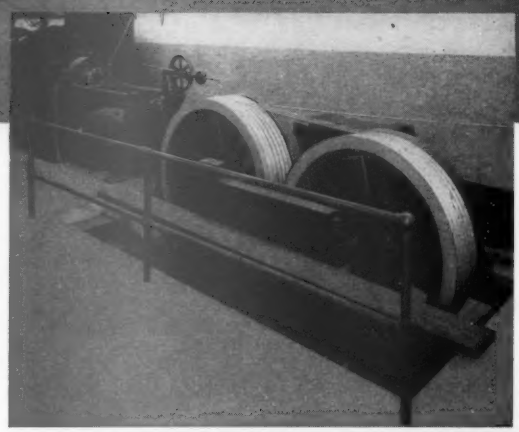




60" multi-groove capstans tilted for straight pull on cable without chafing. Both capstans are driven.

NEBUTTCO

RIGID STRANDER

Engineered with more than a century's manufacturing experience and ruggedly built for continuous, profitable operation, this high speed Strander requires minimum maintenance and produces high quality, uniform cables. All gearing is enclosed and guards are furnished as shown. The Strander is provided throughout with anti-friction bearings.

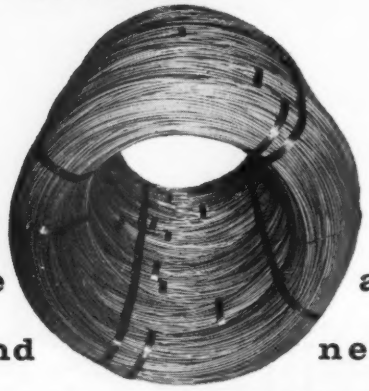
This machine has a capacity up to 37 wires and is supplied with 6, 12, and 18-reel heads. Any combination of spool heads can be supplied. Reels 22" diameter x 11" traverse are accommodated. Each head can be run independently in either direction or all heads can be run in unison in either direction at speeds up to 100 rpm. A speed of 120 rpm can be maintained on the 6-reel head. (150 rpm for aluminum).

For complete information and prices, contact New England Butt Company, Division Wanskuck Company, 304 Pearl Street,, Providence 7, R. I. or James Day (Machinery) Ltd., 28 Maddox Street, London W-1, England.

NEBUTTCO

BRAIDERS
CABLERS · TAKE-UPS
BUNCHERS · STRANDERS
TAPING MACHINES

MARATHON STEEL WIRE



For all specialized steel wire applications, particularly for rollers, balls and needles in anti-friction bearings, Marathon offers advantages derived from more than 150 years experience in specialty steels. Marathon assures best workability and uniform quality of steel wire of all types —alloy, high speed, stainless, tool, heat resistant—available straight or in coils. Specify Marathon, too, for high quality forged alloy steel rolls for flat cold rolling. Contact us and expect immediate attention to all inquiries and individual problems.

MARATHON

SPECIALTY STEELS, INCORPORATED

A Division of Deutsche Edelstahlwerke A. G., Krefeld, West Germany DEW 375 Park Avenue, New York 22, N. Y.

QUALITY DIAMOND DIES

For drawing copper, steel, aluminum, brass, bronze, tungsten, and precious metals
die sizes, .0004 to .160 inches

Die makers for over thirty years, we serve America's leading wire drawing companies. Only the finest hand-picked Brazil stones are used, thus assuring maximum die life. We also offer you dependable recutting service and clean, pure diamond powder graded to your needs.

Write for quotations on your die needs.

MEMBER
INDUSTRIAL DIAMOND ASSOCIATION OF AMERICA, INC.

INDIANA WIRE DIE CO.

314-324 East Wallace Street
Fort Wayne, Indiana, U. S. A.

MADE IN U.S.A.
TO THE STANDARDS
OF AMERICAN INDUSTRY

is the cold-heading wire

Say hard-headed makers of cold-headed products

Scovill has standardized on Cartridge Brass, 70% for brass wire to be used in cold-heading operations and the wire is hot extruded from CONTINUOUS-CAST brass billets.

The alloy has a 5% HIGHER COPPER CONTENT than is generally found in brass cold-heading wire and is more ductile. Continuous casting, itself, assures inherently SOUND metal that is far more uniform.

These superiorities in the alloy, together with special Scovill mill run-down procedures and close control of temper are key factors influencing proper "flow" of metal in cold-heading tools, resulting in uniformly better cold-headed products—with maximum production, minimum rejects.

made better to bring out the ***BEST*** *in your products*

it ***PAYS*** *you to specify...*

BRASS
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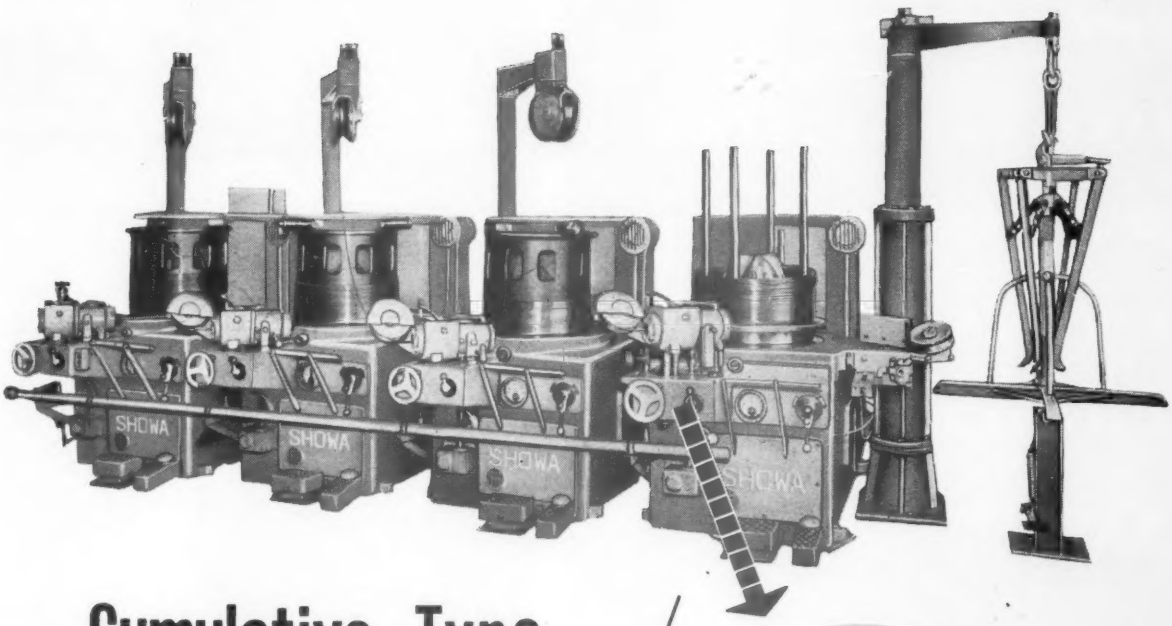
ALUMINUM
MILL PRODUCTS
identified by this trademark

SCOVILL®

SCOVILL MANUFACTURING COMPANY, Mill Products Division, 99 Mill Street, Waterbury 20, Connecticut. Phone PLaza 4-1171.

SSC59B110



Cumulative Type Wire Drawing Machine

for

whole material

Special Attachment

REVOLVING DIE HOLDER

★Perfectly round wire.
★Uniform die-wear.

SHOWA

SHOWA MACHINE WORKS LTD.

No.16, Naka 3-chome, Mitezima, Nishi-Yodogawaku, OSAKA, JAPAN.

WHY MOCO WIRE PROCESSING EQUIPMENT IS YOUR FINEST LONG RANGE INVESTMENT

Magnet wire processing equipment as developed, designed and manufactured by Michigan Oven Company incorporates the same principles of controlled convection and recuperative catalytic incineration which we pioneered and developed for other heat processing applications.

After years of concentrated research and coordinated effort with magnet wire manufacturers, MOCO equipment has been accepted as the finest investment possible in long lasting wire production machinery.

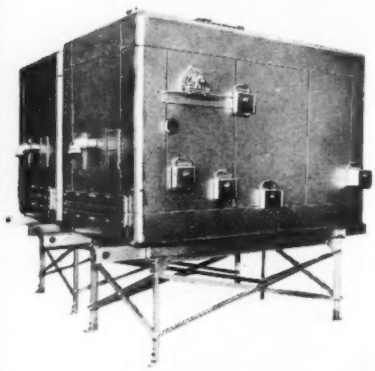
The techniques used are the very latest.

The equipment has been fully tested under the most exhaustive production runs. Michigan Oven Company is aware of all the problems and will cooperate in recommending the proper equipment for specific needs—and, of course, will render special engineering service for unusual applications.

The equipment shown is a partial view of MOCO's wire processing line. Your inquiry on all types of magnet wire processing equipment is welcomed and will be given immediate attention.

SELF GENERATING ATMOSPHERE ANNEALERS

This is the first gas-fired annealer using the heating equipment as an internal inert atmosphere generator. Advanced mixing and burning equipments are utilized which exclude the need for external sources of steam or costly inert atmospheres. Available in horizontal or vertical mounting positions.

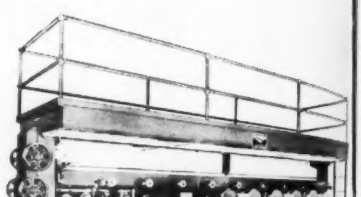


HORIZONTAL WIRE ENAMELING OVENS

These horizontal fine wire enameling ovens for either gas or electric heating operate on MOCO's high velocity recirculating principle. They are equipped with internal catalysts insuring low fuel consumption, freedom from condensation and elimination of objectionable exhaust fumes. Accessories such as enamel applicators and sheaves are available.

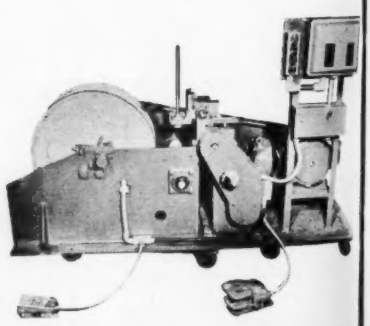
UNIVERSAL REEL OR DRUM PACKER

MOCO was first to develop and install a universal wire packaging machine with combination takeup unit permitting packaging of wire on 6" or 12" diameter spools or in either 100 lb. capacity pails or 500 lb. capacity barrels. Packaging arrangements are optional from spindle to spindle without machine alteration.



SPECIAL REELERS

High speed, heavy-duty wire traversing takeups for heavy round and rectangular conductors. Reel capacity up to 1000 lbs. and speeds up to 500 feet per minute. A variety of drives are available for tieing in to various types of equipment.



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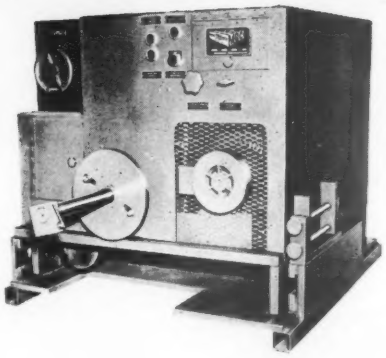
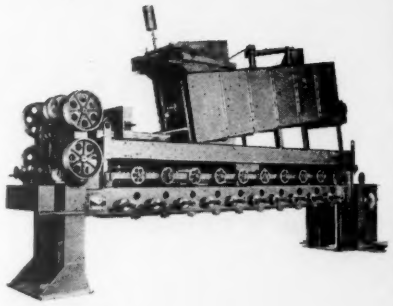
LEVEL WINDERS

Traversing reel type, layer wind takeups for heavy round and rectangular conductors. Infinitely variable traverse adjustments over a wide range of wire sizes. Reel capacity – 500 lb. maximum. Wire speed – up to 100 feet per minute.



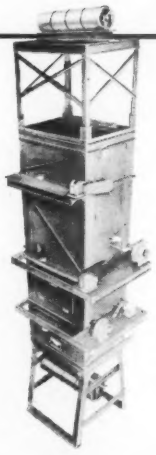
HEAVY ROUND AND RECTANGULAR TAKEUP

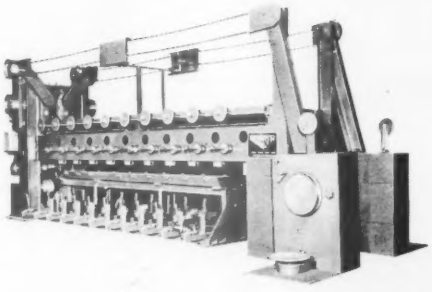
Four strand takeup unit for heavy round and rectangular conductors, with preannealing ovens mounted on top. These units are available up to 6 strands, with either dual capstan or fleeter ring assemblies.



VERTICAL WIRE ENAMELING OVENS

This vertical two-zone high velocity axial flow recirculating wire enameling oven has internal recuperative catalytic unit which eliminates condensate and recovers latent solvent energy. Five other models complete the range from the finest wire through large rectangles.



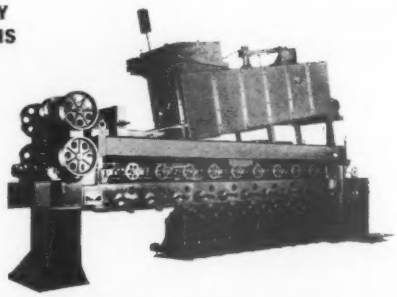


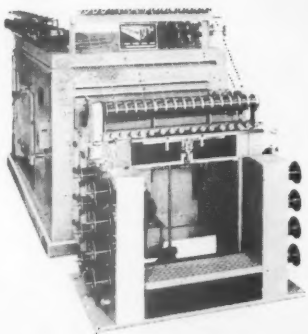
INTERMEDIATE SUPPLY AND TAKEUP MECHANISM

20 Line takeup and supply stands for wire sizes .0089 to .025, inclusive. These units are also available with any number of auxiliary barrel packing units. Designed for operation with the vertical wire enameling oven shown opposite. Custom engineering for special spooling requirements is available.

ENAMELED WIRE SUPPLY AND TAKEUP MECHANISMS

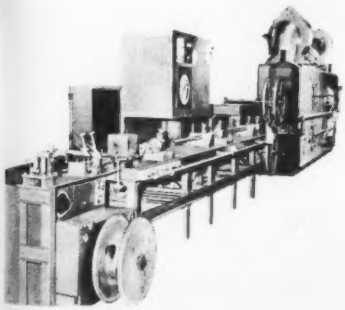
20 Line Heavy-duty spoolers for wires up to and including .072 diameter. These units may be equipped with any number of auxiliary barrel packing units and provide for mounting supply stands beneath and preannealing oven on top. Various arrangements are available for special purposes.





FINE WIRE ENAMELING MACHINE

Typical of the complete line is this type "B" machine which handles wire from 31 A.W.G. to 42 A.W.G. Five other models complete the range from the finest wire through large rectangles. The horizontal, high volumetric, recirculating double-pass oven allows greatly increased production by rapid heat impartation and a high degree of temperature uniformity.



TEXTILE INSULATING AND IMPREGNATING MACHINES

MOCO was first to develop and install rapid heat-cool tunnel type varnish impregnating ovens. This MOCO double insulating machine and layer wind takeup applies two servings of glass or yarn and four coats of baked insulating varnish simultaneously to heavy rounds and rectangulars. Quick starts and stops are accomplished without production loss.

MICHIGAN OVEN COMPANY

MOCO

WIRE EQUIPMENT DIVISION
425 Brainard Street
Detroit 1, Michigan

Please send me complete information on the many outstanding MOCO features:

- ☐ Wire Enameling Machines
- ☐ Glass Insulating Machines
- ☐ Other
- ☐ Self-generating atmosphere Annealers
- ☐ Reel-R-Drum Packers

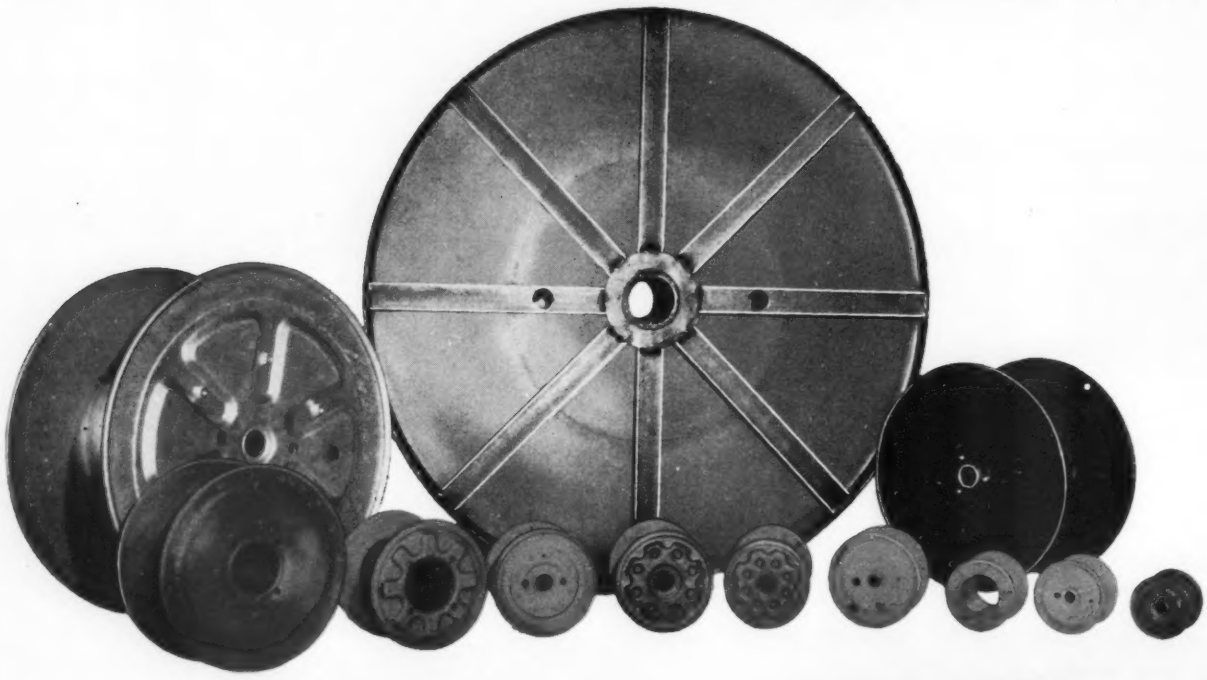
NAME_____ TITLE_____

COMPANY_____ ADDRESS_____

CITY_____ ZONE_____ STATE_____

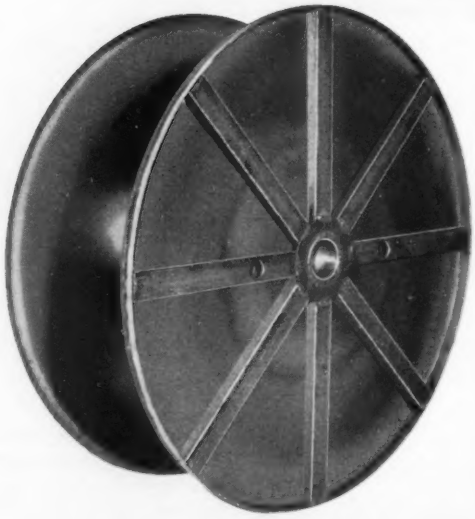
Steel SPOOLS and REELS?

Yes, We Make Them!



Many types and constructions of Steel Spools and Reels for Shipping and Shop use in plain, painted or plated finishes.

In addition to our standard sizes of Steel Spools, we also have facilities and equipment for producing custom designed Spools and Reels to customers' specifications.



HUBBARD SPOOL DIVISION
The American Pulley Company

GARRETT, INDIANA • TELEPHONE 840

BUY FROM REEL HEADQUARTERS - HUBBARD. ALL MATERIALS AND TYPES

The Wire Outlook

The consumer is king. What he does in the matter of buying determines to a large degree the kind of business that may be expected.

Consumer attitudes are good, as measured by retail sales, and surveys give promise that because of them we can anticipate continuing satisfactory business.

Nothing on the order of a boom, however. Business is leveling off and output has been declining. Automobile production has been cut back, steel is a little lower, household appliance production is tending downward and building construction figures have been revised to lower expectations. Industrial machinery sales, nevertheless, are likely to go up.

The cutbacks are moderate and reflect a more realistic attitude on the part of manufacturers than was current in the forepart of the year. As it looks now, the first quarter may be the highest of the year because of inventory building. The second quarter will be quieter, but good. The third quarter will experience the usual summer slackness. And in the final quarter, a new pick-up in all segments of the economy should be under way.

While there appears to be some contradiction in the foregoing statements, it should be noted that new car sales will be up about 20 percent over last year, household equipment sales are larger, and new home buying is up. Families with incomes of $7500 or more now account for 22 percent of the total and it is estimated that 25 percent have liquid assets of $2000 or more.

Inventory gains rose $600 million in February, mostly metals for durable goods, bringing total inventories to something like $4 billion over the same time in 1959. Adjustment of stocks to a more reasonable relationship to needs will take some months. This factor accounts for some of the pessimistic expressions of opinion, for a sales department can't sell an overstocked buyer. Government analysts see good business ahead.

One thing is certain, prices cannot be raised without bringing on a new flood of imports, which will squeeze profits, reduce jobs, and curtail markets for domestic products. Some merchant wire product manufacturers have taken the bull by the horns in trying to meet the import situation by reducing prices. Foreign production capacity is increasing constantly and overseas output is penetrating more deeply all the time. Union leaders should face this fact and cooperate with management.

The snows, severe temperatures and subsequent floods throughout the Midwest have all had an effect on slowing down business. It has affected merchant wire sales, which have not shown the usual Spring upsurge. The demand for manufacturers' wire is also a bit lighter, due primarily to curtailments in automotive orders. Deliveries on merchant wire is running about two weeks and manufacturers' wire about four. Strand for prestressed concrete is an active item and welded mesh is moving well.

Brass mill business has been poor due to a combination of weather and imports, although some improvement is looked for in brass wire sales. A few mills are doing better than last year, although this is not general.

Inflation must be resisted if we are to hold our markets. There is no present indication that the government will help domestic producers. It is not possible to say that any one thing can promote prosperity. We must have capital investment, productive labor, good management and prices that will attract buyers. Were the government to curtail waste and unnecessary spending, start paying off the national debt, and revise, reduce and simplify taxes, it would go a long way toward stopping inflationary trends. And, were labor to jump on the bandwagon and do an honest day's work for a day's pay, this combination would contribute to a new release of purchasing power that would help industry to sell its products.

It also might be suggested that industry leaders have the faith of healthy optimism— not pollyanna stuff—but the same confidence in the future that makes our populace willing to spend its hard-earned income.

Edmund D. Sickels

EDITOR

STEELSKIN

#120

Ten years ago we developed this fused metallic-stearate lubricant containing extreme pressure ingredients for the drawing of stainless steel wire. Today it is one of our more popular lubricants in stainless and carbon steel wire-drawing mills throughout the nation. "STEELSKIN" #120 Powder has the property of picking up and forming a strong, heavy lubricant coating on the first pass.

Customers report drawing stainless as many as five holes without annealing and recoating. When used in drawing lime coated stainless steel, "STEELSKIN" #120 has eliminated the need for lead coating. It is compatible with either lime or borax-type coatings on carbon steels.

If you are *not* using "STEELSKIN" #120 in the drawing of rope wire . . . oil-tempered wire . . . music wire . . . tire-bead wire . . . valve-spring wire . . . stainless cold-heading wire, and nickel-chromium alloys, contact us for further information, today.

"STEELSKIN"
First in
Lubrication
First in
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Vol. 35 MAY, 1960 NO. 5

Improved Paperwork Benefits Both Company and Customer

by L. V. Barnes, President
The Yost Superior Company
Springfield, Ohio

This article relates the manner in which a wire product manufacturer revised its paperwork methods and, as a sidelight, how they secured employee cooperation in the changeover to the new system.

Improved paperwork handling has provided us with benefits all along the line — from order entry to invoicing, from production to shipping — helping us to reduce the time taken to process an order and ship it from over 36 hours down to a single working day, and even less if necessary.

* * *

While that is very gratifying, of even greater importance to our minds is that the changes in methods were made with the wholehearted support of all our employees and full consideration of our customers' needs. As a result of our determination to keep these two points up front at all times, we feel that the advantages of the new system are even greater than they might normally have been.

Figure 1 — L. V. Barnes (right), President of The Yost Superior Company, Springfield, Ohio, discusses flow chart of new procedures with Standard Register Company's representative, D. L. Sellers. * * * * * *

Figure 2 — Typist enters order information on 12-part Zipset combined invoice-shop order-shipping form. Customer's order has been checked and relevant information has been assembled so that operator can enter all typewritten data at this one writing. * *

* * *

A couple of years ago we were faced with the same type of problems that bedevil many a company — large or small — these days. Handling the necessary paperwork had become a timewasting, labor-wasting operation. It was dated, inefficient, costly, and otherwise detrimental to the company's sound economic health. It took several repetitious writings of information to prepare an order for production; more time was lost in production, translating the information into the finished product; additional time was lost in shipping where extra papers had to be filled in; and there was still the invoicing to handle, requiring still more writing.

* * *

Figure 3 — Labor information is entered on long copies of form by office manager. This information appears only on copies meant for internal use. Form has four full-length copies and eight half-size copies. * * * * *

Figure 4 — In Production Manager's office, work order copy is placed in plastic envelope to provide protection as it moves through the production processes.

With no change in basic equipment, but an important change in the design of our business forms, we have been able to reduce the number of writings to one, with only a few manual additions having to be made along the way. This has meant more speed, less waste, increased efficiency, greater customer satisfaction, and close to 100% accuracy in all phases of our operations. And we have the backing of our customers and employees.

* * *

The Yost Superior Company is a manufacturer of precision mechanical springs and formed wire parts. Seemingly, these form only one product, but the diversity within that product is great and we manufacture to specifications, which means that our paperwork is often more than might be considered nomal for our size and operation.

* * *

It started in 1902 as The Yost Gearless Motor Company; The Superior Spring Company was later purchased and the company was chartered in 1924 as an Ohio corporation. Selling is done throughout the United States, but the heaviest volume is confined to Ohio and its neighboring states. We employ about 53 people, eight of whom are office personnel, and our 1958 volume was $700,000. Saleswise, the job is to help customers develop the component parts for their products and almost all of our production is on a special product basis for original equipment manufacturers.

* * *

Orders come in directly from the customer. Under the old system, we would have to type up a shop order — a six-part form requiring both sides to be filled in. That meant removing the carbons and then reinserting them — a considerable waste of time and effort. At later points, a manila material tag was typed, a two-part packing slip was handwritten, a three-part bill of lading or a two-part label or bag tag was handwritten, and, finally, a three-part invoice was typed. In addition, information had to be entered by hand as the forms followed their paths around the office and shop. No two of these forms were alike in size or design — another point in favor of a change.

* * *

Recognizing the necessity of a change, we called in specialists from **The Standard Register Company,** and with their cooperation we analyzed the problem, charted the work flow, redesigned the forms, and communicated to the employees what we were doing and how we were doing it. The heart of the new method is the new form, designed so that one writing will enter all basic information for all purposes and provide copies for all departments concerned.

* * *

The form is a 12-part Zipset, four parts of which are full size, 8½ x 11″, the other eight parts being half size, 8½ x 5½″. The form is printed in two colors which provide practical guides as well as good looks. Items with blue headings are to be typed in the original order entering and invoicing operations, while red headings indicate where manual entries are to go. Thus, at a glance, a person

Figure 5 — Exact data as to which dies or jigs or other special tools should be used are shown on work order copies, giving production worker a quick and simple reference, thus increasing his time on actual production.

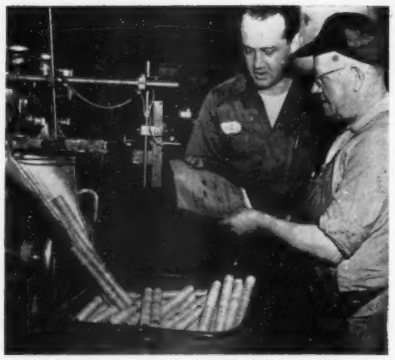


Figure 6 — Continual handling of work order copy by employees has no detrimental effect on it since it is fully protected by envelope.

handling the form can see exactly where information must be placed.

* * *

The differentiation in part sizes was made so that information intended only for internal use would not appear on copies to be sent out of the plant.

* * *

Incoming orders are generally accompanied by blueprints unless they are repeats. In any case, they are all checked thoroughly for a number of things. To do this, we maintain files of previous orders, customer reference cards, and product estimate cards. From these we can note on the original order the price of the part; special tools, jigs or dies necessary to production; and other pertinent facts in accordance with past actions, customer requirements, and our own experience. The order is then ready for typing.

* * *

Using an electric typewriter, as before, the operator types all the available information on the 12-part Zipset. The order forms are consecutively numbered so that we have a permanent numerical record of orders handled. When completed, the order and other papers are checked by the office manager who writes in certain labor information at the bottom of the long copies. The form is then ready for separation; and the old order, customer reference card and product estimate card are filed away.

* * *

Copies 1-4, being three invoices and an accounting copy, are filed away pending receipt of shipping information; copy 5 is the customer's acknowledgement; and copy

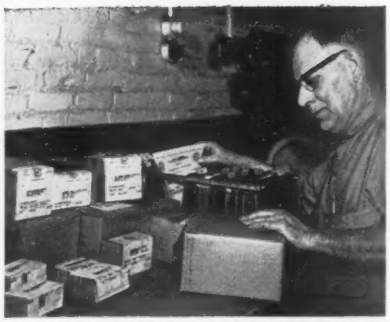


Figure 7 — Packages ready for shipment via parcel post are labelled with integral part of the 12-part Zipset prepared previously. All information as to what package contains can be seen immediately, relieving receiving department of any wasted effort. * * *

6 is the salesman's copy; all six copies are half-size. Copies 10 (half-size packing slip), 11 (half-size gum-backed label), and 12 (full-size shipping copy) are sent to the shipping department and held there until the material is ready for shipment. Copies 7-9, all full-size, are the production copies and go to the Production Manager for further processing.

* * *

In the Production Manager's office, the order is checked for material requirements and copy 7 is sent to accounting to await shipment information. Copy 9 is filed as a follow-up and is destroyed after shipment. Copy 8 is the Work Order. We insert this copy in a transparent plastic envelope and it is sent out to the shop where it accompanies the order all the way through to shipping. Use of this envelope has eliminated the need for a manila tag and it keeps the order clean and safe as it moves through the manufacturing procedures.

* * *

When the finished products arrive in shipping, the relevant copies of the order are pulled. Any information pertaining to labor, quantity, shipping date, and so forth, is added. The label, having already been typed, is affixed to the package with the packing slip inside. The label is a distinct improvement over the old style method. Since it has all information on it describing the contents of the package, it makes the receiving company's job a simple one. There is no need at that end to open the package in order to find out what it contains, so the receiving department can send it through right away or hold it as the occasion demands.

* * *

We have not incorporated a bill of lading section in the form since we do most of our shipping by parcel post. Only a few shipments a day will be heavy enough to warrant express or other type shipping; and therefore, a bill of lading would be excess paper. When one is needed, it is prepared in shipping.

* * *

The order copy (#8) and the shipping copy (#12) are then sent up to the accounting department to be matched with copy 7. Data as to labor and material costs are added to copy 7 and extensions are made. Copies 1-4 are pulled and the extensions are incorporated in the typing. The first three are then mailed to the customer; copy 4 is filed along with copy 7 and previous shop orders for that customer. Copy 8 is also filed as a permanent accounts receivable copy. If the shipment was complete, copy 12 is destroyed; otherwise, it is returned to shipping to be held until another order is prepared to take care of the back-order.

* * *

Compared to our former procedure, the new system is a straightforward one with each step logically following the one preceding. Each copy of the form has a definite place to go and job to do and there is no waste movement at any station. Its advantages are several.

Figure 8 — Clerk adds costing information, additional labor data, and extends prices on forms after shipment has taken place. A copy will then go to the invoice clerk who pulls matching invoice copies from file, types up extensions, and mails to customer. * *

* * *

The greatest advantage to us is in the form of the added and improved service we are now able to render our customers. Shipments and invoicing have both been speeded up considerably. We are now able to get an order to the production department in a 24-hour period whereas before it took more than 36 hours normally. If necessary, we can get an order out in less than a day. Accuracy has improved greatly. Our forms are now clearly identifiable and acknowledgements and invoices, being the same size and having the same design, are easily recognized, lessening confusion at the customers' end. The gummed label, noted above, is also a plus feature that helps the customer cut down on his own work.

* * *

The improved speed in invoicing means that the customer will usually get an invoice in advance of the material. This, too, provides him with an advantage not possible before.

* * *

Reduction of time has also been accomplished through the design of the form in another way. We have added a section through which we can list the tools or dies necessary to a particular job. The information is taken from a previous order or results from our own experience and it eliminates much time on the production worker's part — time he used to spend working this information out himself. This gives him more time on the job itself and increases his earning power.

* * *

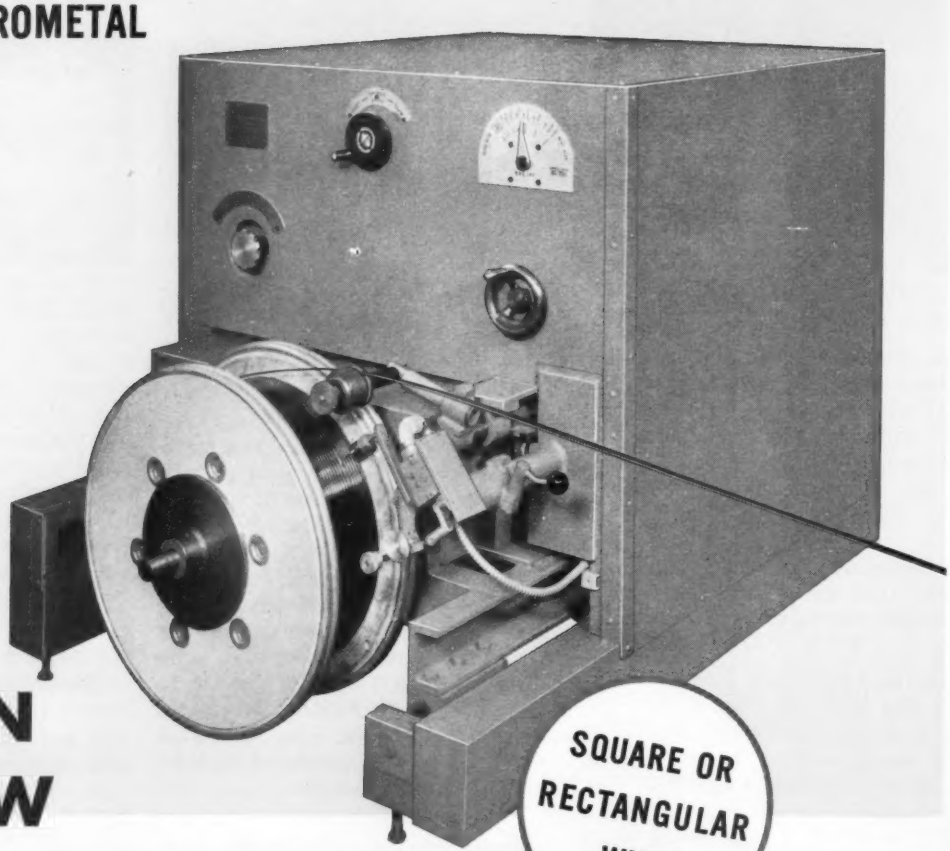
Savings have also been made in the personnel area, but not by eliminating jobs or people. We have, however, been able to take advantage of normal turnover. Wherever marriageable women are employed, there is always a fairly high turnover. Previously, we have had to replace anyone who left, but now we need not replace in every case.

(*Please turn to page* 659)

Again, ACROMETAL

slashes

costs



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616 North 5th Street, Minneapolis 1, Minnesota

Insulated Wire Manufacturing Costs Trimmed with Diameter Control Gauge

by William F. Zimmerman
Plant Manager
American Metal Moulding Company
Irvington, New Jersey

Lowering production costs involves a never-ending search for ways and means to keep abreast or ahead of competitive pressures. How one phase of cost trimming has been achieved is described in this article.

Our company has found it possible to save dollars a day on its modern wire line with a photoelectric gauge that can be operated at a cost of only a few cents a month.

* * *

Diameter of the vinyl-coated building wire is maintained within Underwriters' tolerances by an automatic gauge control system that, in its 18 months of service, has not needed so much as a new vacuum tube. The result has been better insulated wire at lower cost.

* * *

A 10,000-foot reel of finished wire rolls off the line every ten minutes and over-tolerance runs can cost a lot of money. Using the gauge, diameters do not vary more than plus or minus a quarter of a mil on an average run.

* * *

Running slightly oversize is common practice when an operator must make manual checks of line diameter. Because the wire can be "miked" only occasionally, the tendency is to keep the tolerance limit on the high side to insure that specifications are met.

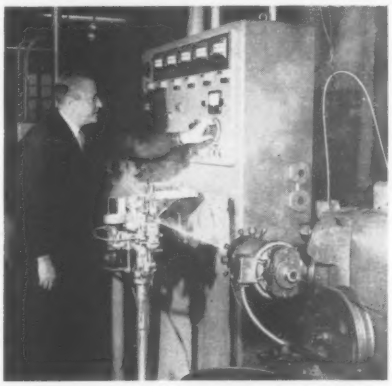


Figure 1 — Wire take-away speed of Ammco's wire line is controlled by a photoelectric gauge that measures precisely any deviations in diameter of the vinyl insulation. William Zimmerman, plant manager, is shown making an adjustment of the motorized potentiometer that translates the signals of the gauge into wire speed changes. Uncoated wire at lower right passes through extruder cross-head, is jacketed with vinyl, and goes to printing stand which marks voltage rating, size, and maker's name continuously. Wire then enters 55-foot-long water trough which cools the hot plastic coating. * * * * * *

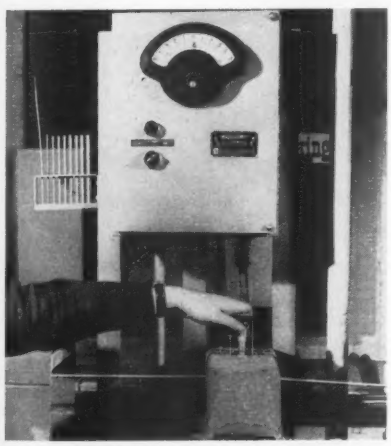


Figure 2 — No. 12 conductor passes from sparker (left), through measuring head of the photoelectric gauge, and on to take-up reels. Diameter setting mechanism, integral with gauge head, is protected by metal guard. Adjustment is necessary only when the line is being changed from one wire size to another. Operator can then attend to other duties, confident that diameter variations will be automatically corrected. Measuring console of gauge is shown above photoelectric head.

* * *

Thermoplastic insulation material costs 26¢ a pound and the company's extrusion line at Irvington, operates about 55 hours a week. Running five thousandths oversize on a conductor as small as #12 would waste 3¾ pounds of compound per hour. On a 24-hour run, 90 pounds of lost compound at 26¢ a pound would cost $23.40, and further processing of over-size wire can add substantially greater losses.

* * *

The non-contact gauge*, which is based on principles of light measurement, monitors the plastic-coated wire with a double beam of light. Signals generated by the shadow of the wire on a phototube detector are amplified, translated, and displayed directly in thousandths of an inch on a wide-scale meter. The operator sets the gauge before starting a new run and the gauge then maintains the needed coating diameter continuously and precisely.

* * *

When the gauge head senses a deviation in the diameter of the wire's vinyl jacket due to some process variation such as a change in plastic viscosity, the interpretation circuitry of the gauge sends a signal to the main control console, initiating a motorized potentiometer. The "pot" acts upon the line's capstan drive to speed up or slow down the wire passing through the extruder cross-head. This

*Made by Weston Instruments Div., Daystrom, Inc., whose technicians worked closely with Ammco in designing and installing the diameter control equipment that has proven so satisfactory.

(*Please turn to page* 658)

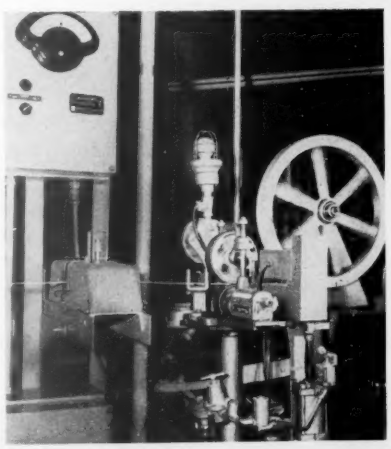
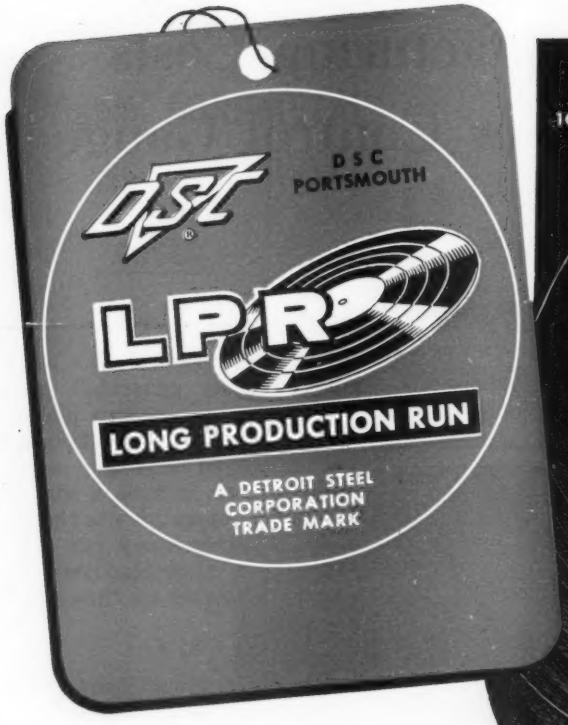
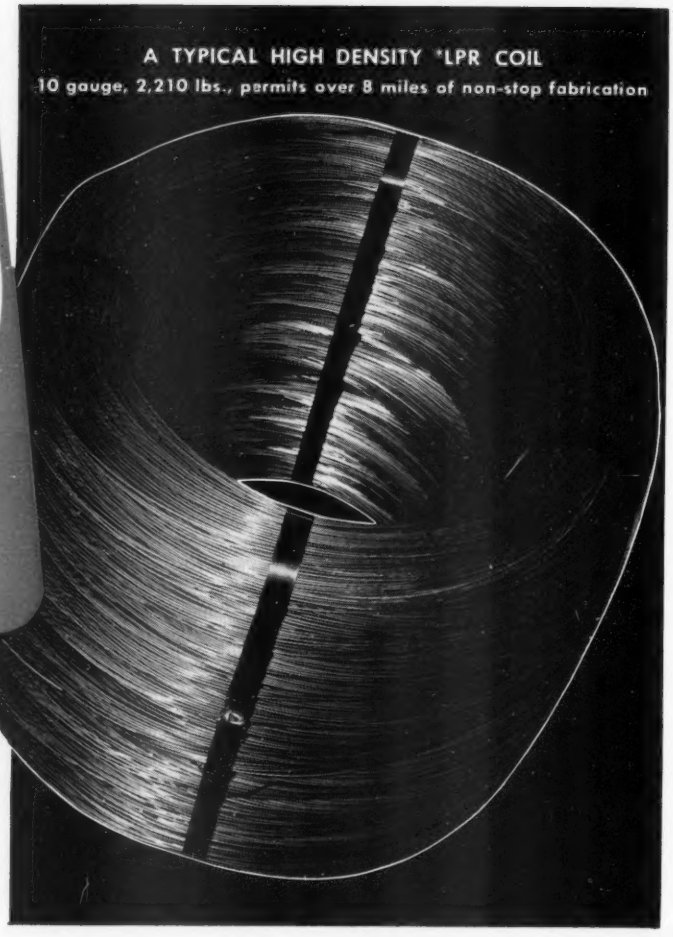


Figure 3 — Automatic wire diameter control permits almost complete automation of Ammco's wire line. Wire footage counter to right of gauge head measures off 10,000 feet, then signals changeover of take-up reels. "Dancer column" at right keeps line slack-free. * *





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Flat Rolled and Wire Products

Ditridecyl Phthalate (DTDP) In High Temperature Vinyl Insulation

by William A. Dimler, Jr.
Enjay Laboratories
Linden, New Jersey

This paper was presented at the Eighth Annual Symposium on Technical Progress in Communication Wires and Cables, sponsored by the U. S. Army Signal Research and Development Laboratories, on December 1, 1959, at Asbury Park, N. J.

I. Introduction

The use of polyvinyl chloride (PVC) plastic for coating wire and cable has grown tremendously in the last several years. The downward trend of the price of both PVC resin and vinyl plasticizers has been of particular interest to wire extruders. The favorable economics of vinyl extrusion coupled with its ability to meet the insulation requirements of the industry have led to vinyl plastic being the preferred insulation.

* * *

Vinyl insulation requires proper formulation for each end use application. The choice of plasticizer, from both a performance and economic standpoint, is of critical importance. Phthalate plasticizers based on oxo alcohols have gained wide acceptance in the insulation field because of their balance of desirable properties and low cost. Now, a new phthalate plasticizer based on oxo tridecyl alcohol has extended the range of application of oxo phthalates in vinyl insulation. Ditridecyl phthalate (DTDP) has demonstrated performance characteristics equivalent to higher-priced plasticizers when tested in high temperature vinyl insulation.

* * *

Other potential plasticizers based on tridecyl alcohol immediately suggest themselves. Preliminary data indicate that two such plasticizers—decyl tridecyl phthalate (DTP) and ditridecyl adipate (DTDA)—have interesting properties that should be investigated further.

II. The Oxo Process and Tridecyl Alcohol

The oxo process was first commercialized in this country in 1948. Since then, this process has become a major source of alcohols for polyvinyl chloride plasticizers.

* * *

Several major companies produce oxo chemicals and with the recent expansions that have been announced, a plentiful supply of oxo alcohols, and hence their phthalates, is assured for the future.

* * *

The chemistry and patent literature of the oxo process have already received excellent coverage in the literature (1). Suffice it to say here that the higher oxo alcohols are prepared by the oxonation of olefins readily available from petroleum sources.

* * *

Tridecyl alcohol, which is prepared from propylene tetramer, has been in commercial production since 1954. It has already found large-scale use in the surfactant industry. Tridecyl alcohol is a mixture of isomeric primary alcohols, predominantly tetramethyl nonanols. The physical properties are given in Table I.

TABLE I
TYPICAL PROPERTIES OF TRIDECYL ALCOHOL

Specific Gravity, 20/20°C.	0.845
Flash Point, Open Cup, °F.	245
Pour Point, °F.	<-95
Refractive Index, n_D^{20}	1.4475
Viscosity at 20°C., centistokes	47.5
Mid-boiling Point, °C.	255
Solubility in Water at 20°C., Wt. %	<0.05
Solubility, Water in, at 20°C., Wt. %	1.6
Color, Pt-Co	5

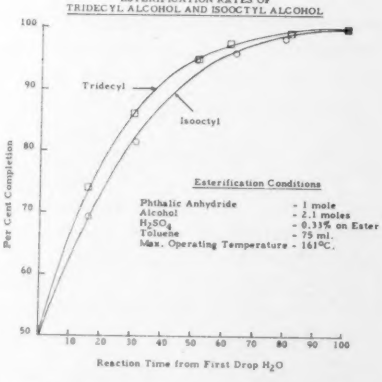
III. Esterification of Tridecyl Alcohol

Tridecyl alcohol presents no problems in esterification. Using conventional esterification techniques (2), tridecyl alcohol can be handled in the same manner and with the same catalysts as isooctyl and decyl alcohols.

* * *

It was noted that the esterification rates and yields were essentially equivalent when isooctyl, decyl, and tridecyl oxo alcohols were esterified with phthalic anhydride using a toluene entrainer and 0.33 wt. % of sulfuric acid (based on theoretical ester). The esterification rates of tridecyl alcohol and isooctyl alcohol are plotted in Figure 1.

FIGURE 1
ESTERIFICATION RATES OF TRIDECYL ALCOHOL AND ISOOCTYL ALCOHOL



The physical properties of ditridecyl phthalate are given in Table II. While the color of DTDP does not yet compare with the water-white color of DDP and DIOP, it is equal to or better than the color of most polymeric ester plasticizers in use today.

TABLE II
TYPICAL PROPERTIES OF DITRIDECYL PHTHALATE

Specific Gravity, 20/20°C.	0.953
Flash Point, Open Cup, °F.	480
Pour Point, °F.	-35
Refractive Index, n_D^{20}	1.4851
Viscosity at 20°C., centistokes	334
Mid-boiling Point at 3.5 mm. Hg, °C.	286
Solubility in Water at 20°C., Wt. %	0.0
Solubility, Water in, at 20°C., Wt. %	0.17
Color, Gardner	1

TABLE III
EFFECT OF PARTIAL REPLACEMENT OF DTDP IN VINYL FORMULATION (1)

	Plasticizer Replacement					
	None	Epoxy Oil	C_8 Epoxy Stearate	TCP	DDA	Commercial 105° Compound
Original Properties						
Tensile, psi	2410	2590	2490	2690	2470	2930
Elongation, %	180	250	235	235	250	220
Modulus at 100%, psi	2110	2010	1890	2190	1760	2350
Aged 60 Days at 97°C. (former 90° Wire Test)						
Retained Tensile, %	96	94	94	95	100	94
Retained Elongation, %	95	92	85	89	68	98
Volatility, Wt. %	1.4	1.0	2.0	3.8	8.2	1.2
Electrical Properties						
V. R. at 50°C., ohm-cm. x 10^{-12}	110	20	2	69	83	180
Dielectric Constant	3.92	4.98	4.47	4.33	4.32	4.53
Dissipation Factor, %	6.0	9.9	6.5	8.6	6.5	10.6

(1) Formulation: PVC - 100; Plastizer - 52 (DTDP-39; Other-13); Clay - 15; Dibasic Lead Phthalate - 6; Dibasic Lead Stearate - 1; Bisphenol A - 0.2 Wt. % on DTDP.

TABLE IV
EFFECT OF PARTIAL REPLACEMENT OF DTDP IN VINYL FORMULATION (1)

	Plasticizer Replacement					
	None	Epoxy Oil	C_8 Epoxy Stearate	TCP	DDA	Commercial 105° Compound
U. V. Light Stability (2), Hours						
300	4	0	0	0	2	0+
500	-	2	1	1	4	1
700	-	4	4	4	-	2
Heat Stability at 177°C. (3), Minutes						
60	0	0	0	1	0	0
270	2-	1	1	3	1+	1
390	3	2	1	4	3-	1

(1) Formulation: PVC - 100; Plasticizer - 52 (DTDP-39; Other-13); Clay - 15; Dibasic Lead Phthalate - 6; Dibasic Lead Stearate - 1; Bisphenol A - 0.2 wt. % on DTDP.

(2) Ranking Scale: 0 = No Spotting; 1 = Slightly Spotted; 2 = Considerably Spotted; 3 = Colored and Black Spots; 4 = Black.

(3) Ranking Scale: 0 = No Color Change; 1 = Slightly Tan; 2 = Tan; 3 = Brown; 4 = Dark Brown or Black.

TABLE V
PHYSICAL PROPERTIES OF DTDP AND P.E. ESTER-PLASTICIZED VINYL AFTER SEVEN DAYS AGING AT 136°C. (1)

	U. L. Spec., Min.	Plasticizer DTDP	P.E.(2) Ester	P.E.(3) Ester	P.E.(4) Ester
Original Properties					
Tensile, psi	1500	2380	2730	2680	2600
Elongation, %	100	180	295	230	215
Modulus at 100%, psi		2020	1600	2050	2120
Aged Seven Days at 136°C.					
Retained Tensile, %	65	97	104	93	84
Retained Elongation, %	65	80	81	87	40
Volatility, Wt. %	--	3.2	6.4	2.8	1.6

(1) Formulation: PVC-100; Plasticizer-52; Clay-15; Dibasic Lead Phthalate-6; Dibasic Lead Stearate-1; Bisphenol A-0.2 wt. % on DTDP.

(2) P. E. ester based on average six carbon straight chain acid.

(3) P. E. ester based on average eight carbon straight chain acid.

(4) P. E. ester based on eight carbon branched chain acid.

TABLE VI
PHYSICAL PROPERTIES OF VINYL INSULATION PLASTICIZED WITH DTDP AND DDP (1)

	U. L. Spec., Min.	U. L. Data DTDP	U. L. Data DDP	Enjay Data DTDP	Enjay Data DDP	Enjay Data 105° Cpd.
Original Properties						
Tensile, psi	1500	2970	2870	3120	3140	3100
Elongation, %	100	300	345	370	430	320
Dielectric Strength, kv	(2)	27.5	28.3			
Insulation Resistance, megohms	1.5	1020	4390			
Flame Test	1"/min., max.	extinguished itself immediately.				
7 Days at 121°C.	----------	90° Wire Tests				
Retained Tensile, %	65	101	102	109	99	99
Retained Elongation, %	65	100	70	100	83	89
Retained Dielectric Strength, %	50(3)	127	119			
7 Days at 136°C.	----------	105° Wire Tests				
Retained Tensile, %	65	104	too brittle to measure	102	too brittle to measure	102
Retained Elongation, %	65	92		83		83
Retained Dielectric Strength, %	50(3)	113	49			
1 Day at 113°C.						
Insulation Resistance, megohms	0.01	0.32	3.33			
7 Days at 113°C.						
Insulation Resistance, megohms	0.01	0.36	2.15			

(1) Formulation: PVC-100; Plasticizer-52; Clay-15; Dibasic Lead Phthalate-6; Dibasic Lead Stearate-1; Bisphenol A-0.1 wt. % on DDP, 0.2 wt. % on DTDP.

(2) Must hold 2,000 volts for one minute. Both compounds pass. No specification on initial dielectric strength.

(3) Must hold 2,000 volts for one minute at test temperature. Both compounds pass.

TABLE VII
CORRELATION BETWEEN 75 MIL PADS AND 1/32" INSULATION AFTER AGING AT 121°C.

	Plasticizer (1) DDP Pad	DDP Wire	DTDP Pad	DTDP Wire	105° Cpd. Pad	105° Cpd. Wire
Original Properties						
Tensile, psi	2540	3180	2380	3120	2860	3100
Elongation, %	290	430	225	370	240	320
Modulus at 100%, psi	1800	1840	1930	2200	2355	2470
Aged 7 Days at 121°C.(2)						
Retained Tensile, %	102	94	96	96	90	99
Retained Elongation, %	83	85	98	92	92	91
Volatility, Wt. %	7.2	8.5	1.6	1.9	1.4	1.4

(1) Formulation: PVC - 100; Plasticizer - 52; Clay - 15; Dibasic Lead Phthalate - 6; Dibasic Lead Stearate - 1; Bisphenol A - 0.1 wt. % on DDP, 0.2 wt. % on DTDP.

(2) Samples run in individual glass tubes with an air velocity of 500 linear feet per minute.

TABLE VIII
60° OIL-RESISTANT TEST ON DDP AND DTDP-PLASTICIZED WIRE INSULATIONS (1)

	U. L. Spec., Min.	Plasticizer DDP	Plasticizer DTDP
Original Physical Properties			
Tensile, psi	1500	3140	3120
Elongation, %	100	430	370
Modulus at 100%, psi	--	1880	2200
Aged 4 Days at 100°C. (2)			
Retained Tensile, %	60	107	103
Retained Elongation, %	60	77	87

(1) Formulation: PVC Resin - 100; Plasticizer - 52; Clay - 15; Dibasic Lead Phthalate - 6; Dibasic Lead Stearate - 1; Bisphenol A - 0.1 wt. % on DDP, 0.2 wt. % on DTDP.

(2) Aged in ASTM Oil #2.

TABLE IX
LOW TEMPERATURE PERFORMANCE OF OXO PHTHALATE PLASTICIZED VINYL (1)

	Plasticizer DDP	Plasticizer DTDP	105° Cpd.
Clash Berg T_f, °C. (2)	-19.5	-18.5	-4
4 Hours at -40°C. (3)	pass	pass	fail

(1) Formulation: PVC - 100; Plasticizer - 52; Clay - 15; Dibasic Lead Phthalate - 6; Dibasic Lead Stearate - 1; Bisphenol A - 0.1 wt. % on DDP, 0.2 wt. % on DTDP.

(2) 75 mil pads.

(3) 1/32" insulation. To pass test, compounds shall show no cracks while being wound around a mandrel at -40°C.

TABLE X
EFFECT OF BPA ON DTDP-PLASTICIZED VINYL PADS

	U. L. Spec., Min.	Bisphenol A, Wt. % on DTDP 0.2	0.4	0.6	0.8	1.0
Original Properties						
Tensile, psi	1500	2520	2500	2415	2525	2540
Elongation, %	100	230	230	215	230	230
Modulus at 100%, psi	---	1970	1965	1990	1980	1970
Aged 7 Days at 136°C.		-------- 105° Wire Test ---------				
Retained Tensile, %	65	91	92	94	95	92
Retained Elongation, %	65	72	80	91	83	83
Volatility, Wt. %	---	3.5	3.3	3.1	3.3	2.7
Aged 11 Days at 136°C.						
Retained Tensile, %	---	90	94	100	90	97
Retained Elongation, %	---	33	72	77	72	76
Volatility, Wt. %	---	7.6 (Black)	5.9	5.3	6.0	5.2

Formulation: PVC - 100; DTDP - 52; Clay - 15; Dibasic Lead Phthalate - 6; Dibasic Lead Stearate - 1; Bisphenol A - as shown.

IV. DTDP in High Temperature Vinyl Insulation

Ditridecyl phthalate has a vapor pressure considerably lower than the other commercially available oxo phthalates. A logical application for this low volatility characteristic of DTDP is in the high

temperature vinyl insulation field. Here the severe heat-aging specifications are the critical factor in the choice of the plasticizer.

* * *

Preliminary data obtained on electrical vinyl pads show that DTDP-plasticized vinyl has good retention of properties on heat aging and excellent electrical properties that are comparable to a commercial 105° compound. Blending other plasticizers with DTDP generally leads to poorer retention of properties as well as poorer electrical characteristics (Table III). As with all phthalates, the incorporation of an epoxy oil or an epoxystearate improves DTDP's excellent heat stability as well as its light stability (Table IV).

* * *

In another experiment, DTDP was compared to the commonly-used pentaerythritol (P.E.) esters as a 105° wire plasticizer. The data show that DTDP is fully equivalent to the P.E. esters after seven days aging at 136° C. (Table V). Since DTDP enjoys a considerable economic advantage over these esters, it is apparent that DTDP is a worthwhile consideration as a high temperature vinyl plasticizer.

* * *

The critical evaluation of a plasticizer, however, is in a wire extrusion compound. DTDP has been evaluated in a typical formulation extruded onto copper wire (1/32″ vinyl coating on No. 14 AWG wire). These evaluations show that it easily passes the stringent Underwriters' Laboratories' (U.L.) heat-aging tests for 90° and 105° wire. These data were confirmed by Underwriters' Laboratories. The test data on the DTDP formulation, a DDP formulation, and a commercial 105° wire insulation compound are summarized in Table VI. DTDP is believed to be the first phthalate ester to have been successfully incorporated as a primary plasticizer in a vinyl formulation that passed the 105° wire test.

* * *

The data presented above were obtained on 75 mil pads and 1/32″ vinyl insulation. A good correlation has been found to exist when both the wire and pads are aged under identical conditions. Although the original properties of the pad and wire insulation samples of the same formulation are very different, the retained properties are similar (Table VII). Although U.L. tests only the finished wire insulation, it is felt that valuable information can be obtained from pad data in predicting the success or failure of extruded compounds.

V. DTDP in Other Vinyl Insulation

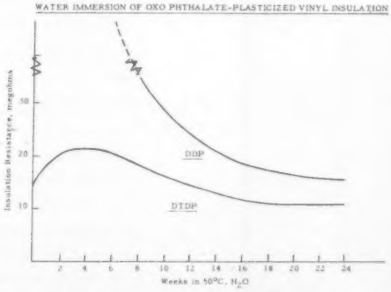
In addition to high temperature insulation, other applications of DTDP in the wire and cable industry are of interest. Complementing its low volatility, the low temperature characteristics and electrical properties of DTDP-plasticized insulation warrant investigation of DTDP in other types of wire.

* * *

For TW wire, the insulation resistance (I.R.) of the vinyl insulator while immersed in water is of critical importance. Tests have been conducted on DDP and DTDP-plasticized insulation immersed in 50°C. water for 24 weeks. After this period of time, the DTDP compound shows excellent I.R. stability in addition to its high I.R. (100 times greater than the U.L. requirement — Figure 2). At 100° C., the compound retains its physical properties after months of aging. It is felt that DTDP will be eminently suitable for the new THW wire classification. The excellent electrical properties and heat-aging characteristics of DTDP compounds make this plasticizer one of the prime choices for this application.

FIGURE 2

WATER IMMERSION OF OXO PHTHALATE-PLASTICIZED VINYL INSULATION



Another use for DTDP-plasticized insulation is for 60° oil-resistant wire. In the U.L. test for this wire, the DTDP compound retained 87% of its elongation and 103% of its tensil strength which far exceeds the U.L. requirement (Table VIII).

* * *

The low temperature characteristics of DTDP-plasticized insulation suggest its use as a jacketing compound. DTDP is equivalent to the other oxo phthalates in low temperature performance in vinyl. In this respect, DTDP is superior to other high temperature vinyl plasticizers (Table IX).

VI. Bisphenol A in Oxo Phthalate-Plasticized Insulation (3, 4)

The use of bisphenol A (BPA) as a plasticizer stabilizer is required in order to obtain maximum performance from DTDP in vinyl electrical formulations. The formulation that passed Underwriters' Laboratories' tests (Table VI) contained 0.2 wt. % BPA, based on DTDP. More recently, it has been demonstrated that increasing this level to a 0.4-0.5 wt. %, based on ester, leads to still better retention of elongation after oven aging.

* * *

The effect of BPA concentration was demonstrated by heat-aging 75 mil pads of a vinyl electrical formulation for extended periods of time at 136°C. Even after eleven days of aging at 136°C., those specimens having 0.4 wt. % or more of BPA on DTDP had good retention of elongation (ca. 75%) whereas the formulation with 0.2 wt. % BPA had retained 33% of elongation (Table X). For 105° wire applications, 0.4-0.5 wt. % of BPA on DTDP is recommended.

* * *

All the data presented above show that DTDP can be used profitably in vinyl wire insulation. The choice of other ingredients can be made by the individual formulator in terms of his previous experience with the other oxo phthalates. DTDP can be regarded as a typical oxo phthalate whose excellent heat-aging properties allow it to enter a new field of vinyl formulation.

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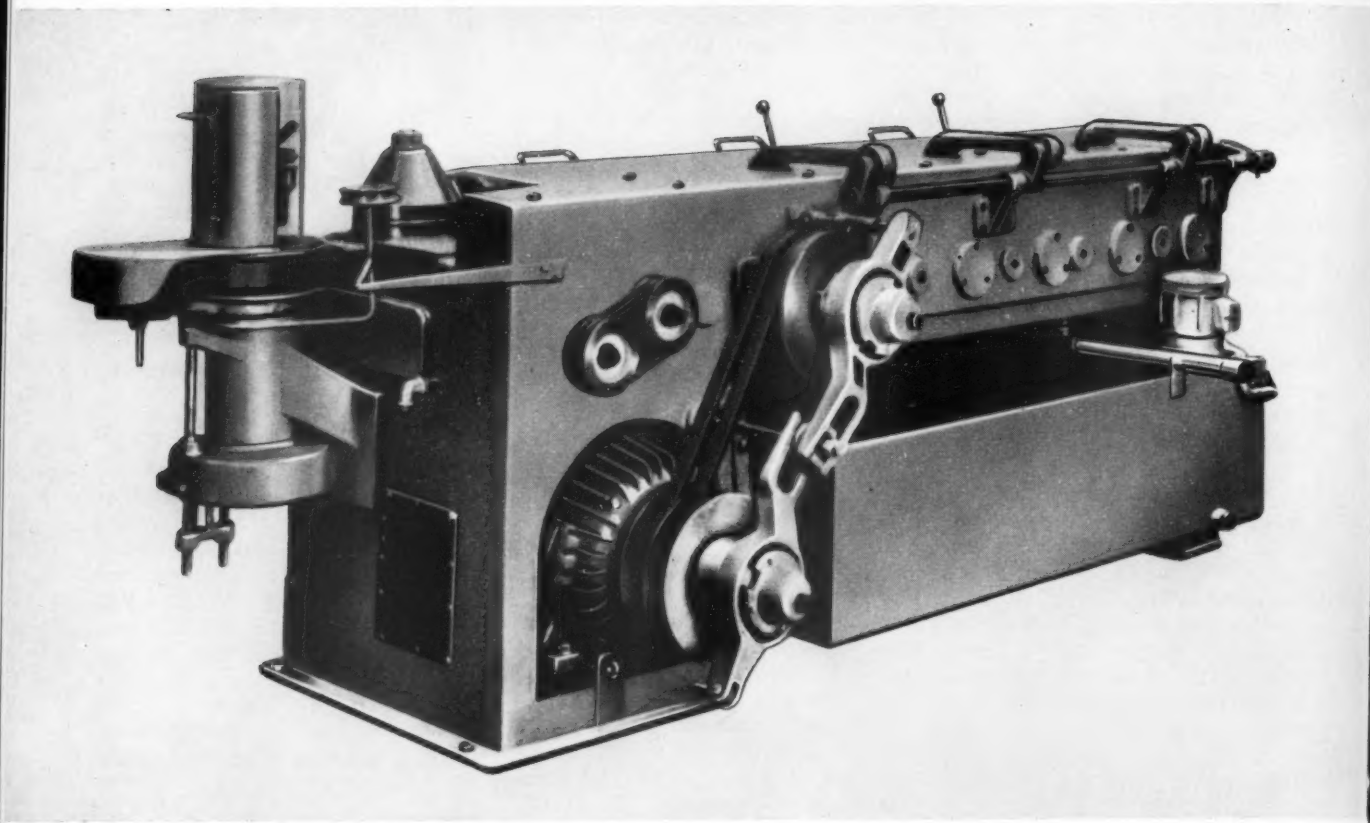
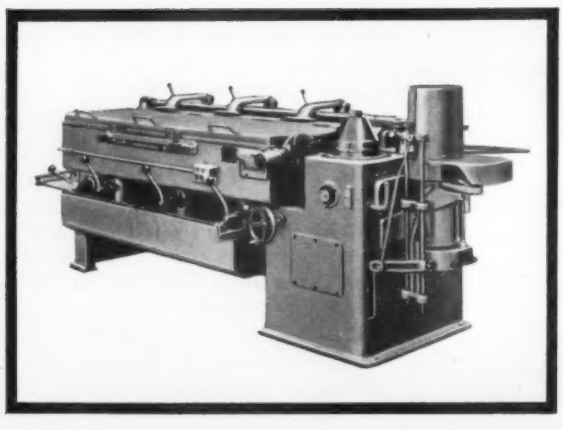


Wire Drawing Machines



Type GZK Heavy Wire Drawing Machine of vertical block design,
maximum traction power 10 tons (22000 lbs), block diameter 800 and 600 millimeters (32 and 24 in.), machine can be supplied for straight-line drawing too.

Type MZK Medium Section Wire Drawing Machine of vertical block design,
maximum traction power 3000 to 800 kilos (6600 to 1750 lbs) corresponding to block diameter of 550, 450 and 320 millimeters (22, 18 and 12.$^1/_2$ in).
Double deck blocks on demand.

Type NZK Wet Drawing Machine, up to 25 dies, block diameter 275 or 210 millimeters (11 or 8 in.) for coil removal and with spooler up to 45 kilos (100 lbs) capacity.

Type FZK Fine Wire Drawing Machine, up to 24 dies, with spooler up to 2,5 kilos (5.$^1/_2$ lbs) capacity.

Type SZK Copper Rod Shaving Machine,
maximum entry size 15 millimeters (.590 in.),
block diameter 600 millimeters (24 in.).
All the Drawing Machines except the Heavy Wire Type can be equipped with infinitely variable speed drive.

Auxiliary Equipment
Type ASK Wire Pointer with two roller pairs
Type EVK power driven Threading-up Device
Type EAK powered Coil Removing Device
Type EMK Descaling Machine
Type SPK Wire Spooler Universal Coil Winder

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Wet Wiredrawing

by J. K. Annandale, Manager
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The author is a graduate of the Manchester College of Technology and an Associate Member of the Institute of Mechanical Engineers. He presented this paper before the Staff School of Frederick Smith & Co. Wire Manufacturers Ltd., through whose courtesy it is published.

General Considerations

Introduction

The purpose of wiredrawing is to reduce wire from its original form to a lesser cross-sectional dimension. This is achieved by pulling it through a tapered hole which has been carefully made in tungsten carbide or other hard material, know as a die.

* * *

In order to avoid damaging the surface of wire, excessive die wear, and wire seizing in the die, it is necessary to lubricate the wire before it enters the die. With steel wire, a dry lubricant such as soap is more often used, but for certain products it is essential to apply an aqueous solution of, for example, soluble oil. The process is then called wet wiredrawing as opposed to dry drawing.

Surface Finish

Wet drawn wire has a very clean surface, depending upon the strength of lubricant and the amount of drawing. Some advantages of clean surface are:

(a) Machinery or equipment through which the wire may subsequently be passed is not fouled or clogged by any foreign matter coming off the wire.
(b) When putting the wire through any subsequent process it is not necessary first to clean it with a degreasing or other agent.
(c) When fabricated in conjunction with other materials, a high standard of cleanliness can be maintained.
(d) The appearance of the wire is considerably improved.

Demand

Wet drawn wire is used for the manufacture of such articles as pins, hairpins, staples, brushes, shoes, mattresses and corsets; for the assembly of boxes, cartons and magazines; in welded products; and in the weaving of guards or screens.

It is required with a galvanised or copper coat, or with no coating, and in the latter case is referred to as "Bright" Wet Drawn. There are other classes in between. Depending upon the usage, it is also required in a variety of tensile strengths. These are achieved by use of an appropriate analysis of steel, and the degree of cold work or drawing.

Degree of Wet Drawing

Steel Wire of a given analysis has to be drawn a definite amount from its soft condition in order to attain a specified tensile strength. The starting point in the soft condition can be either a hot rolled rod or a heat-treated wire, depending upon the ultimate size of the drawn wire.

* * *

The amount of drawing is referred to in terms of percentage reduction in cross-sectional area (%R.A.). For example — wire .160″ diameter drawn 40% R.A. from a rod base would have approximately the same tensile strength as a wire .060″ diameter drawn 40% R.A. from an annealed base, assuming both had the same analysis.

* * *

Wire required with a wet drawn finish is not necessarily wet drawn all the way from soft condition to finished size. In the case of galvanised wire, lacquered wire and some classes of bright wire, this can be done if machinery is available to give the required R.A. Where a fully coppered coat is required, however, the wire cannot be drawn more than about 30% R.A. after coppering or the resultant coating would be insufficient. In the case of bright wire, if no discoloration is permitted, the degree of wet drawing is limited by the necessary lack of coating and weakness of lubricant to about 20% R.A.

* * *

According to the tensile requirements in the finished wire the gap which may exist between the size at which the wire is heat-treated and the size at which wet drawing can commence, has to be bridged by dry drawing. Any soap or similar deposits on the wire must then be removed during the preparations before the final wet drawing.

* * *

For most practical purposes wet wiredrawing can be divided into work which can be done by drawing the wire through one or two dies, and that which can be done by drawing it through a large number of dies. This groups the machines required into 1 or 2 hole machines and multi-hole machines.

1 or 2 Hole Wet Drawing

It is convenient to refer to wire which is awaiting the next process as "base wire". If the base wire has been dry drawn, the lubricant will have to be removed, and immersion in boiling soda ash is one way of doing this.

* * *

Should a coppered finish be required, the wire will then require to be cleaned by a quick dip in acid — either hydrochloric or sulphuric — and swilled with water before immersion in the coppering solution. There are various mixtures, some proprietary, but a common solution contains copper sulphate, sulphuric acid, barm and soft soap. It is advantageous to agitate the wire at each stage.

* * *

If the base wire is in the an-

nealed condition the same procedure is adopted except for the first stage, since there will be no lubricant to remove.

* * *

After cleaning or pickling, it is common practice to dip the wire in lime or borax and then dry it before drawing. But the clean polished finish required cannot be obtained by drawing only 1 or 2 holes from wire prepared in this way; therefore it is necessary to take the wire quickly in the wet state from the coppering solution, and place it into a wet lubricant such as soluble oil close to the wiredrawing machine. This dictates that the cleaning and coppering plant must be adjacent to the machines, which in turn presents the problem of fumes from the plant discolouring the wire being drawn, and makes efficient fume extraction very necessary.

Wiredrawing Equipment.

The speed at which wire enters a machine is determined by the final drawing speed and the total reduction in area applied to the wire. In 1 or 2-hole drawing there is little difference between these two speeds because of the light R.A. Since the wire is submerged in a container it cannot pay-off very fast, and the speed of drawing is thereby limited. In order to produce clean wire the strength of lubricant which can be used is restricted, and this again limits the drawing speed. An average figure would be about 500 ft. per minute.

* * *

It is therefore not necessary or even practicable to have complicated or high speed machines for this class of wire. Even the old type wiredrawing benches are suitable for 1 or 2-hole work provided that attention is paid to the means of applying and collecting lubricant, of cooling dies and machines, and of handling the wire.

Multi-Hole Wet Drawing

It has already been said that wire required with a galvanised or lacquered finish, and some classes of bright wire, can be drawn wet from the soft condition to finished size. It is proposed now to enlarge upon this statement.

Galvanised Wire

The greatest proportion of galvanised wire is galvanised after drawing, either hard or furnaced, and either with a heavy coat (fully galvanised) or with a light coat (wiped galvanised). For some purposes — e.g., corset stitching and mattress wire — a smoother surface is required than that obtained from wiped galvanising.

* * *

This is produced by wet drawing from a galvanised base which should be either furnace annealed or patented — depending on whether it is mild steel or higher carbon steel — and wiped to give a light coat. The size of the base would be selected to give the desired tensile strength in the finished drawn wire, and this usually requires about 80% reduction in area.

* * *

It is not necessary to prepare the galvanised wire in any way for further drawing; but it should pass through a dry soap box before entering the machine in order to pick up lubricant. The wet lubricant, e.g. soluble oil — which is then pumped on to the wire, should be quite weak. If it is too strong, the wire is liable to "suck down" — a condition peculiar to galvanised wire, in which the diameter of the wire in places becomes less than that of the wiredrawing die. For this reason it is advisable not to exceed a solution strength of 10%. In cold weather it is advisable to warm the lubricant before starting in order to dissolve the fats, and when in production it is necessary to cool the lubricant in order to prevent it from breaking down. So as to avoid weakening the lubricant, any steam for warming or water cooling should be passed through the lubricant in a closed circuit.

* * *

In considering speed of drawing on multi-hole machines, the pay-off speed is not a limiting factor on account of the greater reduction in area effected. The efficiency with which the lubricant and the block can be cooled is one factor in the limitation of drawing speed; another is the running time for a coil of wire in relation to the number of machines which an operative is tending; and a third is the horsepower of the machine. When drawing to sizes such as 20 gauge, 1500 ft. per minute is considered reasonable for mild steel and 1000 ft. per minute for higher carbon steels.

Lacquered Wire

This is the description given to wire which is required to have a copper tint, as distinct from a deep copper colour. It can therefore be multi-hole wet drawn from annealed fully coppered base.

* * *

The annealed wire would be pickled in hydrochloric or sulphuric acid, thoroughly washed with water, coated in a coppering solution such as that described earlier, washed again, dipped in boiling lime or borax and dried in an oven. Wire prepared in this way would be supplied to the wiredrawing machines in a dry state. It should go through a dry soap box before entering the machine, but in this case the wet lubricant should be of not less than 10% strength — otherwise, the same remarks apply with regard to lubricant as for drawing galvanised wire.

* * *

As in the case of multi-hole drawing of galvanised wire the restrictions arising from 1 or 2-hole drawing do not apply, and depending upon the size of wire and other considerations mentioned in connection with galvanised wire, speeds of 2500 ft. per minute are common.

Bright Wire

It is important to be clear about the meaning of this term. "Bright wet drawn" is broadly accepted as referring to wire, the surface of which is free from any copper coating — in other words, the opposite to "coppered wet drawn". In times when all wet drawing was done on very slow machines or blocks, this description was sufficient, and bright wire in which no discolouration was permitted would be subjected to only a small degree of wet drawing. This practice still continues, as mentioned earlier in this paper.

* * *

The introduction of high speed continuous wet drawing machines created the problem of how to

give wire a big reduction in area without the aid of an initial surface coating.

* * *

For multi-hole dry drawing it was common to "sull-coat" the wire during the cleaning process by allowing it to oxidise without becoming dry, followed by liming and ovening. This was called brown or green coating, and acted as a carrier for the subsequent soap lubricant or as an additional cushion between wire and die surfaces.

* * *

This coating, however, was found insufficient for drawing, say, 23 gauge and finer at 2500 ft. per minute on multi-hole wet machines, in which soluble oil replaced dry soap as a lubricant. The sull-coating would only carry through a few holes, and tungsten carbide dies would not stand up to wet lubricant alone.

* * *

It is possible that a machine in which the first part is dry drawing and the second part wet might be successful, but the principle does not work when applied by entering soap drawn wire into wet drawing machines. A combination of a special oil and a complete set of diamond dies is known to be effective in drawing wire with no coating from 23 to 34g. at a speed of 1500 ft. per min.; however it is not known how this would work on a three-shift continuous running or on thicker sizes. Experiments using the same oil with tungsten carbide dies were not successful.

* * *

It was found that if annealed or patented base wire were coated with a solution of zinc phosphate it could be drawn through soluble oil at the desired speeds as much as 94% reduction in area, provided the first hole was soaped. Preparation of the base wire is most important, the sequence being to pickle in sulphuric acid, wash with water, immerse in zinc phosphate solution, wash with water, dip in boiling lime or borax and dry in an oven. The strength and temperature of the zinc phosphate solution are important and require checking daily. The time of immersion depends upon the grade of solution and the reduction which the wire is to be given. This also needs supervision, for insufficient coating causes trouble in drawing and too much is wasteful without achieving anything. In one case the strength, temperature and time are 16-19 points, 120-140°F. and 5 minutes respectively.

* * *

After drawing the wire has a grey appearance. Hence whilst this is not suitable for the class of wire in which no discolouration is permitted, it is satisfactory for any other classes of bright wire. It would avoid confusion if the special finish were referred to as "bright wet drawn", and the zinc phosphate finish as "wet drawn".

* * *

Unfortunately the cost of zinc phosphate is high and because of the critical nature of wet drawing the overall cost of cleaning and of the wet lubricant are also high compared with like costs for dry drawing.

* * *

Where both wet and dry machines are available for production and capable of drawing the same sizes of wire, wire is wet drawn only if the end-use demands it. On the other hand, if there is a question of purchasing machines to meet a demand for which either wet or dry drawing would be equally suitable, then consideration has to be given to the respective costs of purchase and of maintenance. It is proposed, therefore, to consider these two broad types of machines.

Machinery

Dry Drawing Machines.

Continuous machines contain basically a finishing block, and in line with this, a number of drawing cones or capstans. A die is situated before the first cone, between each cone and before the block. In front of each die can be fitted a box to contain soap or other dry lubricant. The box is usually integral with the die holder, and all dies are water-cooled.

* * *

The wire is drawn through the first soap box and die, taken a number of turns round the first cone, drawn through the second box and die, taken round the second cone and so on until reaching the finishing block. The number of cones and dies will have been determined to suit the work to be drawn.

* * *

Since a given weight of wire is fed into the machine in unit time, the same weight will be produced at each cone in the same time; and since the area of the wire is reduced at each die, the length of wire to be taken up by each succeeding cone must be greater. Normally all cones are the same diameter and this additional length is taken up by increasing the revolutions of successive cones.

* * *

One of the main differences in design of dry machines is connected with the method of driving these cones at the desired speeds. D.C. drive enables the speed of each cone to be varied at will, within certain limits. This has the advantage of being able to use full power and speed irrespective of wire load, and match cone speeds to variations in die diameter.

* * *

A.C. drive, which is not as expensive, limits each cone to its predetermined speed. Die tolerances have to be chosen more carefully in order to ensure that each cone takes on wire at a rate slightly in excess of that required by the succeeding cone; thus creating at each cone a surplus of wire which builds up on the cones as a reservoir.

* * *

Each cone is usually driven by a separate motor, gears and shaft. It follows that a good deal of floor space is required for multi-hole machines, and the cost of all these items of equipment is considerable. An example of a 6-hole machine is shown in Figure 1.

Figure 1 * * * * * * * * * *

Wet Drawing Machines

The intrinsic difference in the design of continuous wet machines is that they are invariably driven by one motor, and the cones are all assembled on two shafts (four, if a very large number of cones are required). Dies are situated in sockets along an arm between the cone assemblies, except for the first and last dies. Lubricant is contained in a tank and pumped so as to spray on to the dies and cones, and in addition, or alternatively, the cones run in the lubricant. In each case the lubricant acts also as a coolant. Preferably the first die should be in a box outside the machine, and in which a dry lubricant can be used. From the first die the wire enters the machine and is passed two or three times round the first cone on the left hand assembly. Thence through the first die on the die arm and two or three times round the first cone on the right hand assembly, and so on until reaching the finishing block or capstan. In cases where it is not necessary to use the full complement of dies it is usually possible to miss out the first few cones. An example of a 14-hole machine is shown in Figure 2.

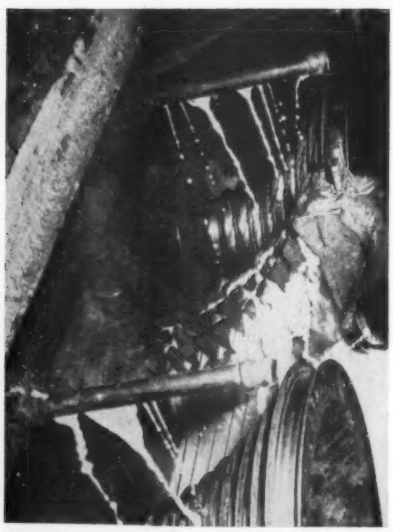

Figure 2

In this type of machine the cones are of differing diameter, being smaller at the entrance and larger at the exit end of the machine. This is an unfortunate feature since wire at its thickest must go on to the smaller cones and as drawn finer on to the larger cones. Each pair of cone assemblies rotate at the same speed; either both can draw or else the left hand assembly can act as a guide to lead the wire into the following die. The cones are either made of hardened steel, or else fitted with hardened bands in which case the bands are renewed as wear takes place. The increase in length of wire produced at each die is taken up by the following cone being greater in diameter than its predecessor.

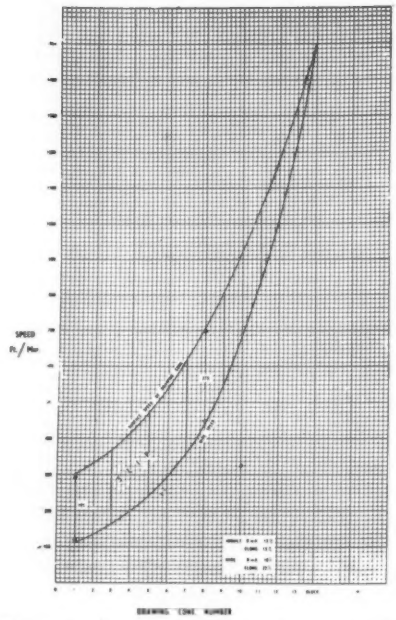

Figure 3

* * *

The machines should be so designed that the reduction in area at each die is suitable to the quality and size range of wire which they are intended to draw. If, for the sake of argument, it is decided that the reduction of area per pass should be 15.4%, then the wire at each die would elongate by 18%. Therefore the speed of each cone would have to be 18% faster than the one before it to take up this wire, and since the cones are on a common shaft their diameter would have to be increased by that amount. In determining cone speeds it is necessary to start from the finishing block and work backwards as follows:

Let B = block speed = 2500 ft. per minute

Let C = wire required from last cont, ft. per minute

from the formula $\frac{\%\ \text{R in A}}{\%\ \text{Elong.}} = \frac{C}{B}$

$$C = \frac{15.4}{18} \times 2500 = 2140 \text{ fpm.}$$

* * *

The same calculations would be applied for each cone backwards along the machine.

* * *

In practice it is not possible to draw wire if the cones run at the same speed as the wire because dies must have a tolerance and vary with wear, and there would be wire breaks caused by too much tension. To overcome this it is

(*Please turn to page* 654)

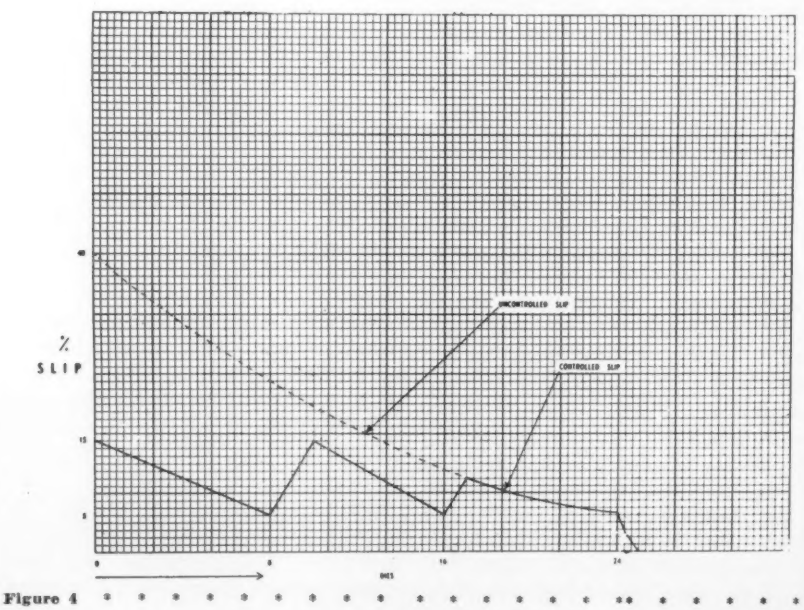

Figure 4

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Clamping Springs for 1400° Brazing

A new special wire being used to hold parts together in the brazing bath retains its temper in repeated usage. How they are employed is described in this article.

Clamping Springs Designed for 1400° F. Brazing

A new superalloy spring wire, NS-25, made by **National-Standard Company,** is "as good as new" after hundreds of operations as a clamping device for brazing brass parts at 1400°F. Manufacturing is simplified, faster, and more precise, according to the **N.R.K. Mfg. and Engineering Company** of Chicago, a prominent producer of precision microwave assemblies and radar components.

* * *

Until spring materials could be obtained that would retain tension while immersed in brazing baths up to 1400°F. N.R.K. had to use cumbersome weights, intricate fixtures, and laborious tack welding in brazing these parts. Producing small-lot custom parts as well as large-run "microwave plumbing," N.R.K. wanted springs to hold components during 1400°F. brass brazing as it did at lower-temperature (1100°F) aluminum brazing. They sought, also, spring material that would be more durable at all temperatures. The problem was solved (Fig. 1) by going exclusively to spring wire made of this new alloy.

* * *

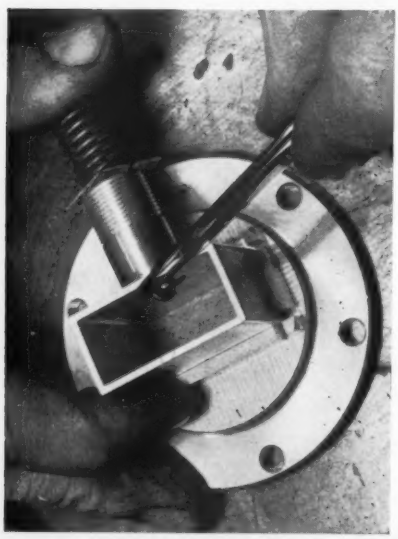


Figure 2 — Threaded collar is held against rectangular waveguide tube by applying spring and slipping a small wire through hook in spring end. * * * * *

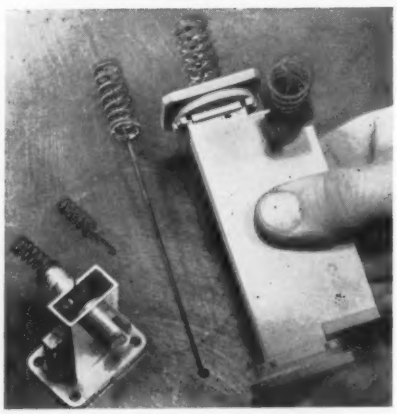


Figure 1 — Parts are held together for 1400° F. brass brazing and 1100°F. aluminum brazing with springs made of National-Standard Company's NS-25 superalloy spring wire. * * * * * * * * * *

The spring assembly technique had been impossible for brass brazing until NS-25 springs were tried because no spring material appeared to be available that would retain tension at the required temperature. Although stainless steel springs were employed for 1100°F aluminum brazing, the technique was costly, since the springs deformed quickly. The stainless steel springs required reshaping after each use and had to be replaced after 60 or 70 brazing operations to be sure that brazed parts would meet specifications. The NS-25 springs are never reshaped after use and have gone through hundreds of operations at 1100°F and 1400°F without any visible change in properties.

Stability Increases Precision

The mechanical stability of the NS-25 spring wire insures proper expansion of the parts during heating. If spring tension is too great, the brazed parts will deform under the spring load. If the tension is too small, the mating parts will not make good contact and an imperfect bond will result. Typical tolerances required on dimensions of complex microwave assemblies after brazing are ±0.002 inches.

Brazing operations are identical in many respects for brass and aluminum parts. The parts to be brazed are assembled and held in place by the springs. Typically, one end of the spring bears directly against a small plate that squeezes down on the parts. The other end of the spring is brought through the center of the helix and out through the other end. This end of the spring is secured by slipping a pin through a hook on the spring end (Fig. 2).

* * *

During assembly, a shim of brazing material may be placed between the parts, or a liquid brazing compound may be applied at the junction. The assemblies are then hung on hangers or set in perforated tote baskets. They are preheated at 1000°F for 15 to 30 minutes and then immersed in a salt bath for a few minutes to be brazed.

Cooling Procedure Varies

Depending on the nature of the parts, they may be rapidly quenched or slowly cooled upon leaving the brazing bath. The parts are then washed in warm water to remove the corrosive flux picked up in the brazing bath. The springs are removed after washing and returned to the assembly bench for reuse without any further re-coiling or other processing.

* * *

The cost savings due to use of the NS-25 springs vary considerably depending on the length of run for a given part and the com-

(*Please turn to page* 657)

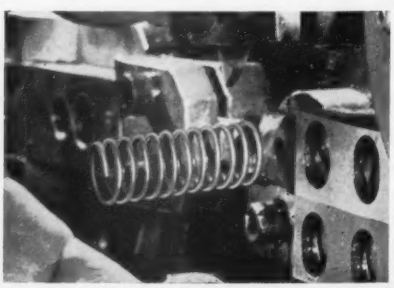
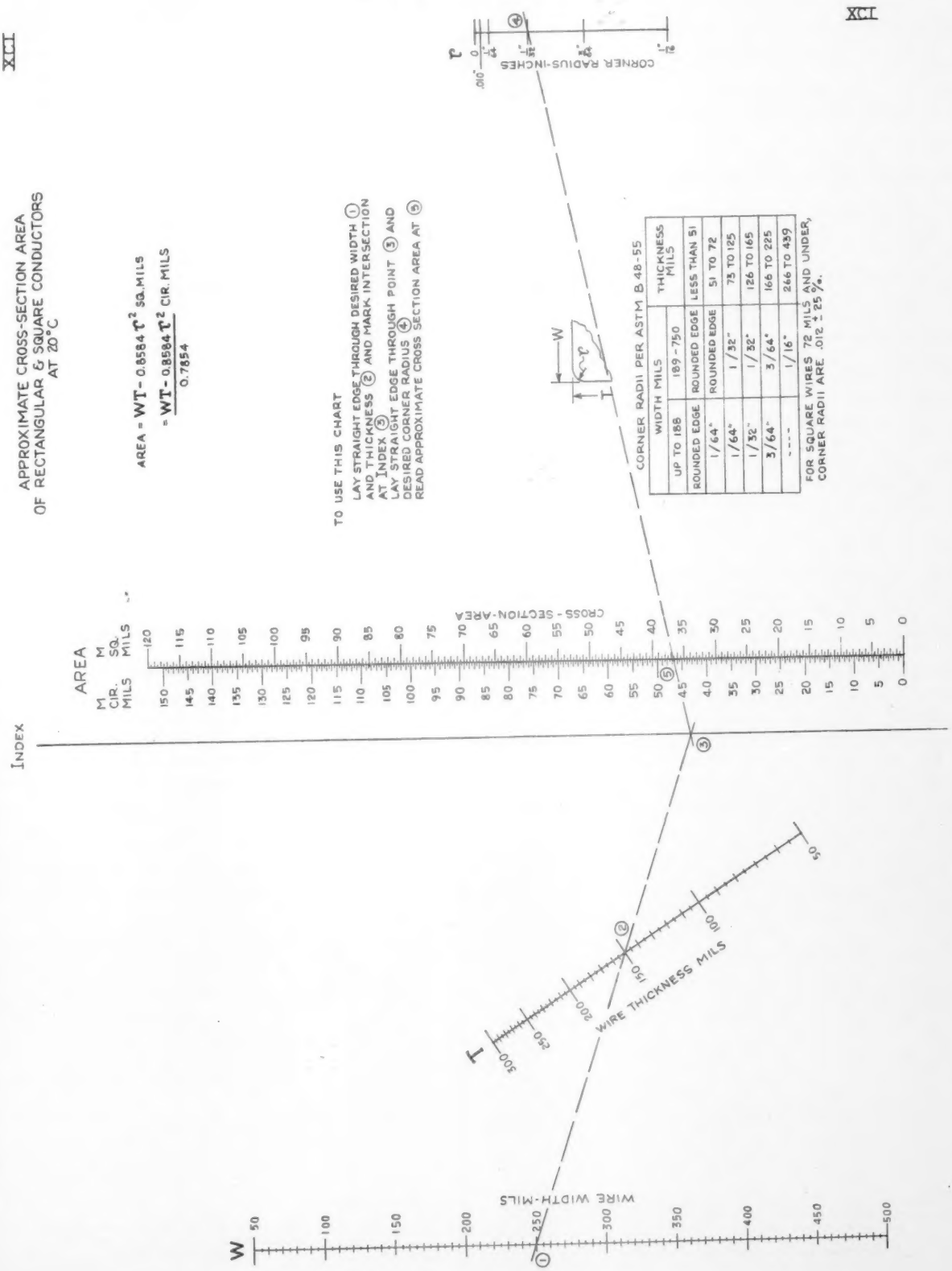


Figure 3 — Coil of NS-25 wire emerging from coiler. * * * * * * * * *

Calculation of Cross Section Area of Rectangular and Square Conductors

by Carlisle V. Burns, Process Engineer, Wire & Cable Dept.
General Electric Company, Bridgeport, Conn.

XCI



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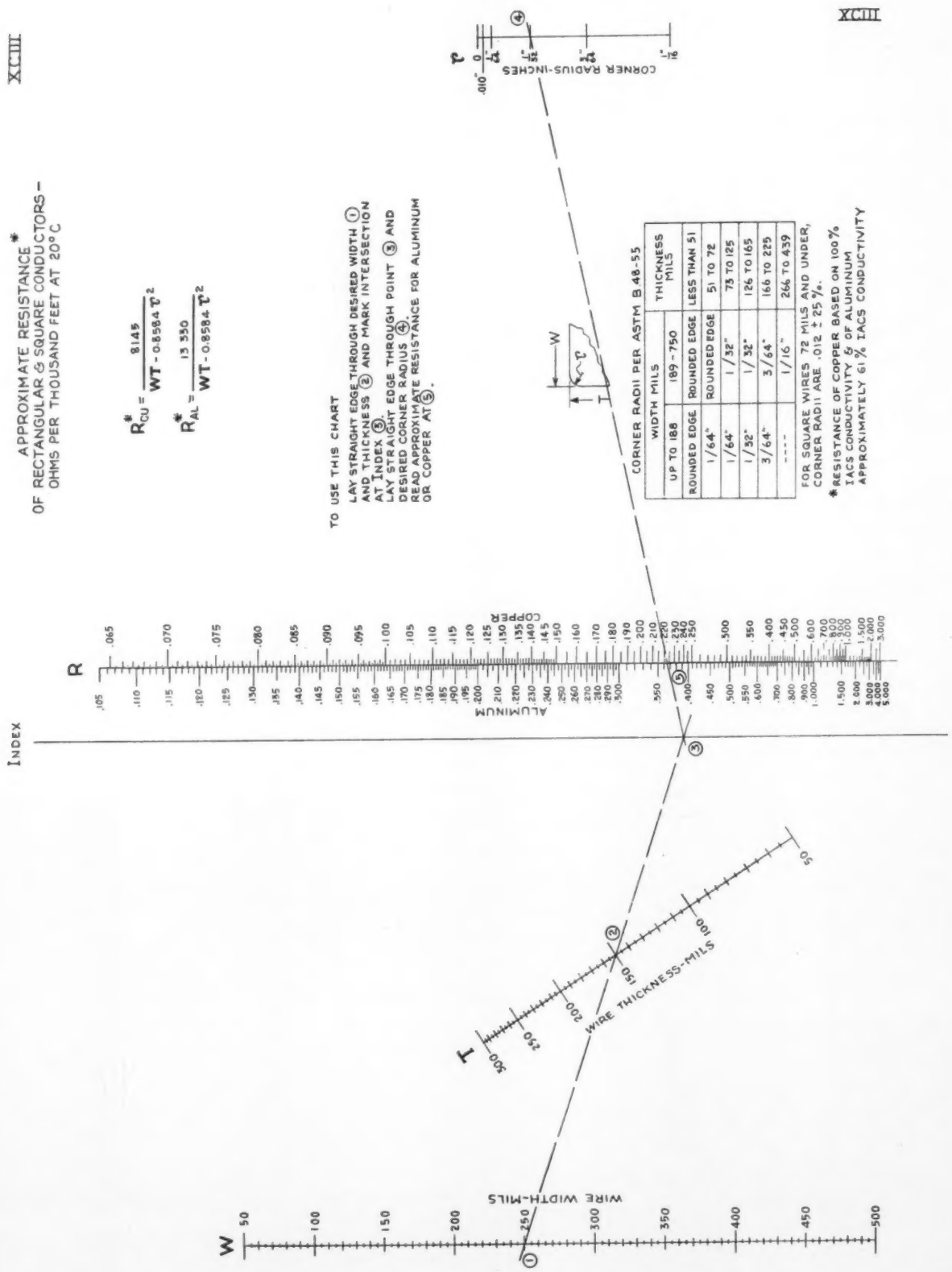
Calculation of Resistance of Rectangular and Square Conductors

by Carlisle V. Burns, Process Engineer, Wire & Cable Dept.
General Electric Company, Bridgeport, Conn.

XCIII


APPROXIMATE RESISTANCE* OF RECTANGULAR & SQUARE CONDUCTORS – OHMS PER THOUSAND FEET AT 20° C
$R^*_{CU} = \frac{8145}{WT - 0.8584\,T^2}$
$R^*_{AL} = \frac{13\,330}{WT - 0.8584\,T^2}$
TO USE THIS CHART
LAY STRAIGHT EDGE THROUGH DESIRED WIDTH ① AND THICKNESS ② AND MARK INTERSECTION AT INDEX ③.
LAY STRAIGHT EDGE THROUGH POINT ③ AND DESIRED CORNER RADIUS ④.
READ APPROXIMATE RESISTANCE FOR ALUMINUM OR COPPER AT ⑤.
CORNER RADII PER ASTM B 48-55
WIDTH MILS
UP TO 188 — ROUNDED EDGE
189 – 750 — ROUNDED EDGE
THICKNESS MILS
1/64" — 1/64" — LESS THAN 51
1/64" — 1/32" — 51 TO 72
1/32" — 1/32" — 73 TO 125
3/64" — 3/64" — 126 TO 165
---- — 1/16" — 166 TO 439
FOR SQUARE WIRES 72 MILS AND UNDER, CORNER RADII ARE .012 ± 25%.
*RESISTANCE OF COPPER BASED ON 100% IACS CONDUCTIVITY & OF ALUMINUM APPROXIMATELY 61% IACS CONDUCTIVITY
CORNER RADIUS-INCHES
W
T
R
COPPER
ALUMINUM
INDEX
WIRE THICKNESS-MILS
WIRE WIDTH-MILS

XCIII

Evaluation of Stress-Strain Recorders

The National Bureau of Standards has recently released data on performance tests of extensometers and recorders used to determine the properties of metals. The tests, conducted on three types of extensometer-recorder systems in use by testing laboratories throughout the country, indicated that such instruments basically are capable of meeting the requirements of government and industry. The investigation was aimed at more functional adaptation and more effective use of equipment producing autographic stress-strain records of tensile tests. It included not only calibrations of stress and strain coordinates but the measurement of other characteristics which affect accuracy — such as the expansion of graph paper in humid weather. The procedures, developed in this work are being made available to industry to aid in the evaluation and calibration of individual recorders.

* * *

Although stress-strain recorders are widely used to determine the mechanical properties of steel, concrete, fabrics, rubber, wood, and plastics, little information is available on their accuracy. However, as recorders find their greatest application in production control — checking the compliance of materials with purchase specifications — accuracy is an important factor. To provide the necessary data on instruments for

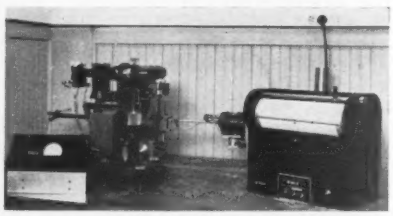


Figure 2 — Calibration apparatus used at the National Bureau of Standards for strain-measuring devices. The equipment employs an interferometer (center) and a photoelectric counter (left) to measure exactly the elongation detected by the extensometer associated with a stress-strain recorder (right). * *

1. **Autographic stress-strain recorders, by Raymond R. Bouche and Douglas R. Tate, ASTM Bul. 228, 33, (February 1958).**

This is a summary of a technical report made by R. R. Bouche and D. R. Tate of the NBS Technical Staff.

Figure 1 — Autographic stress-strain recorder in operation. Recorder (extreme right) is in the process of drawing a typical stress-strain diagram of a material under test (at left). The accuracy of such recorders was recently evaluated at the National Bureau of Standards.

metals testing, the present investigation was undertaken by **R. R. Bouche** and **D. R. Tate** of the Bureau staff as part of a program of basic instrumentation sponsored by the Department of Defense and the Atomic Energy Commission.

* * *

A stress-strain recorder is a highly complex instrument which incorporates several operations in its performance. Essentially it determines certain properties of materials by plotting a curve of stress versus strain on graph paper. The sensing device is an extensometer — an instrument which detects elongation in the test sample and transmits a proportional electrical, mechanical, or optical signal to the recorder. The recorder pen plots the strain proportional to this signal along one coordinate and the stress proportional to the applied load along the other.

Calibration of Strain Coordinate

Since the extensometer controls the recorder strain readings, a precise determination of its accuracy in measuring length increments is necessary. The Bureau performed such a calibration by using the recorder-extensometer combination and an interferometric comparator simultaneously to measure a given displacement. Since the interferometric arrangement is sensitive to displacements smaller than 0.000001 in. a comparison of the two distances reveals any error in the recorder arrangement.

* * *

In the comparison, the increment measured is the displacement of two coaxial bits as they are moved away from each other along their mutual axis. The interferometer and the extensometer are both arranged to measure this movement. As the distance changes, interference fringes are formed in the eyepiece of the interferometer and counted by an attached photoelectric counter. From

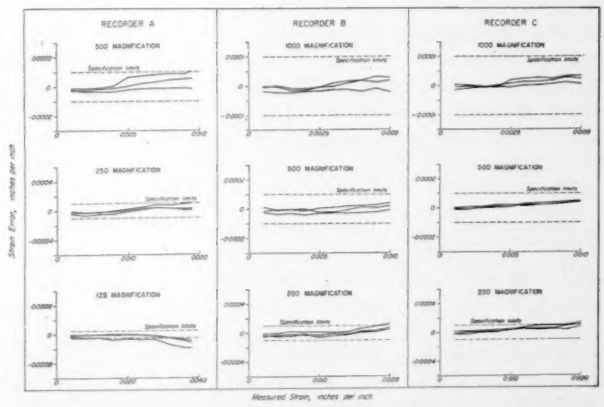


Figure 3 — Calibration curves obtained at the National Bureau of Standards showing the performance on the strain recording axis of three stress-strain recorders. A and B are differential-transformer type recorders and C is an electrical-contact type. All recorders are seen to correspond more closely to the specification limits (ASTM tolerances for Class B extensometers) at higher magnifications. * * * * * * * * * * * * * *

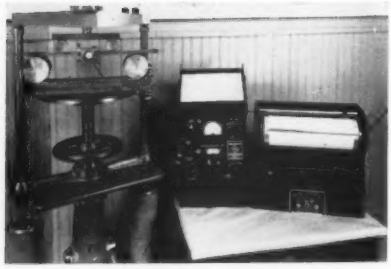


Figure 4 — Assembly employed at the National Bureau of Standards to evaluate the ability of extensometers to measure the average of unequal strains. The difference between the compressive and tensile strain in a loaded beam (left) is measured simultaneously by the recorder (right) and a strain gage (center). The difference between the two readings is the averaging error of the extensometer. * * * * * * * *

the number of fringes and the wavelength of the light used (helium source), the actual distance is determined.

* * *

To check the accuracy of the strain coordinate itself the applied strain is compared to the indicated strain on the chart paper. The applied strain is the extension measured by the interferometer divided by the measured gage length of the extensometer which sometimes differs significantly from its nominal gage length. The indicated strain on the chart paper is based on the extensometer's nominal gage length.

* * *

Each recorder-extensometer combination was calibrated three times at each of its three magnifications. These were either 125, 250, and 500; or 250, 500, and 1000. At the higher magnifications extensometers satisfy more closely the specifications set by the American Society for Testing Materials for Class B extensometers. Class B extensometers are ordinarily used for determining the modulus of elasticity, yield strength, permanent set, or deviations from Hook's law.

* * *

Other inherent characteristics which may further affect recorder accuracy and cause deviation from specification limits are resolution, warm-up time, averaging ability, and load response. Methods of investigating these factors were also devised.

Resolution and Warm-up Time

In determining the resolution of the recorder, extensometers are subjected to extension at a constant speed. The resolution values are the smallest applied extensions capable of moving the recording pen. They are determined by measuring the extension with the interferometric arrangement described above while the rotation of the drum which moves the pen is observed visually with a microscope.

* * *

Another test was conducted to determine how much time is required for the recorder to achieve stability after it is connected to a power supply. In connection with this test observations are made on the magnitude of drift. The recorder, with extensometers attached, is turned on and the rotation of the drum observed as a function of time. It was found that a short warm-up period is required for the differential-transformer type of recorder but not for the electrical-contact recorder. The warm-up time required with the differential-transformer recorder is probably a result of power dissipation in the transformer windings; additional observations showed that the warm-up time is independent of core position.

Determination of Averaging Ability

A test was introduced to evaluate the effectiveness of extensometers in averaging strain. In the actual testing of materials strain

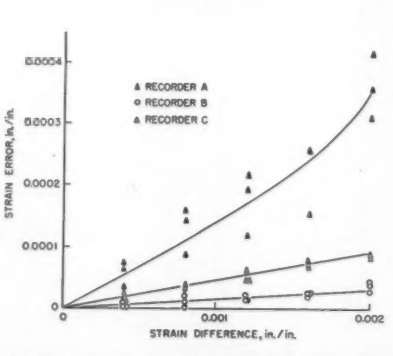


Figure 5 — Test results obtained at the National Bureau of Standards illustrate the ability of extensometers to measure the average of unequal strains. The strain error is plotted against the strain difference for three recorders: A and B are differential transformer type recorders and C is an electrical contact type. The strain difference to which the extensometers were subjected far exceeds that normally present in tensile testing. Yet the strain error is small in comparison to the specified tolerance for such extensometers. * * * * * * * * * *

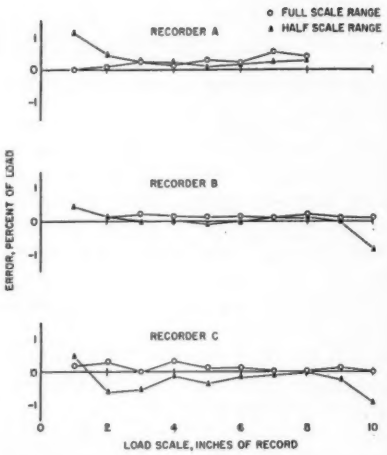


Figure 6 — Curves showing the performance of the load recording coordinates of three representative recorders evaluated by the National Bureau of Standards. The two differential-transformer recorders (A & B) and an electrical-contact recorder (C) were calibrated at both full-scale and half-scale range, and the percent of error plotted against the load expressed in inches of record. * * * *

is not equal in all fibers. Therefore it is necessary to determine the average strain by measuring the extension of two fibers opposite one another on the periphery of the specimen cross-section. Special extensometers are available for this type of measurement.

* * *

The averaging ability of such extensometers can be evaluated by using them to measure the difference between compressive and tensile strain in a beam subjected to a uniform bending moment. A resistance strain gage is also used to measure this difference. The discrepancy between the strain readings in the two devices is the error in the averaging extensometer. This test showed that the strain errors for the extensometers were less than one-fourth of the strain differences.

Calibration of the Load Coordinate

The load coordinate is very simply calibrated by mounting a recorder on a testing machine. The recorder is turned off to prevent the drum from rotating, and in this way made to record only the load. The value of this load can be read directly from the testing machine indicator and this value compared with the recorded load. The errors in the recording of load

(*Please turn to page* 653)

New Insulation Applications of High-Density Polyethylene and Polypropylene

by Dr. W. Paul Acton and Lawrence C. Petzold
Hercules Powder Company, Inc.
Wilmington, Delaware

This paper was presented at the Eighth Annual Symposium on Technical Progress in Communication Wires and Cables, sponsored by the U. S. Army Signal Research and Development Laboratories, at Asbury Park, N. J., on December 2, 1959.

Three years ago, Hercules introduced high-density polyethylene to this symposium with the paper: "Hi-fax Potentials in the Wire and Cable Industry". At that time, high-density polyethylene, as represented by Hercules Hi-fax®, had a lot of "potential" in the eyes of a few believers, but hardly any proven commercial applications. Furthermore, many in the industry had experimented with certain types of high-density polyethylene and found them entirely unsuitable for wire and cable insulation applications. High-density polyethylene compounds were available, however, which were highly resistant to thermal and environmental stress cracking, and in the past three years such specially designed insulation materials have found increasing acceptance in a wide variety of applications.

* * *

The most important properties responsible for the increasing use of HDPE are its toughness and abrasion resistance. This, combined with the excellent electrical properties for which polyethylene is well known, has made it an ideal material for many insulation applications.

* * *

The first successful application of high-density polyethylene, to our knowledge, was in power transmission tree wire. Its toughness and abrasion resistance, not to mention economy (when compared to other **heavy-duty** tree-wire constructions), led to its early acceptance by one large utility company. However, the very property which led to its use—toughness—made it all but unacceptable to many other utilities. It was equally as difficult to strip it off as it was to abrade it off. Just last year a stripping tool which would strip even a 10/64" high density polyethylene insulation with ease was made available. This has helped stimulate a steady growth in the use of high-density polyethylene insulated tree wire.

* * *

Two other closely allied applications for HDPE in power transmission are (1) insulation on spacer-separated cables, and (2) insulation on service drop triplex cables.

* * *

Both of these newer applications utilize the abrasion resistance of high-density polyethylene.

* * *

Since this symposium is dedicated to communication wire and cable, let's leave the power transmission field and turn to communications. One of the most significant events in the short history of high-density polyethylene to date took place just this year. A multiconductor communication cable, WM-130, designed by the Signal Corps for extra-rugged field use, specified high-density polyethylene as the primary insulation. The construction and expected use of this cable required an insulation highly resistant to cut-through and abrasion resistance, and high-density polyethylene is meeting these requirements.

* * *

In the past, telephone line wire was nearly all bare wire. Recently, however, interest has been increasing in insulated line wire. The reasons for this are many. The copper-coated steel wires which are being installed to accommodate carrier frequency operation require protection from damage and corrosion. Certain contaminated areas such as coastal regions and oil refinery areas present corrosion problems even to galvanized steel wire. A recent trend toward longer spans requires insulated wires to prevent mid-span shorts. Finally, lines strung through areas containing many trees require less tree-trimming attention when insulated wires are used. The relatively thin coating on these wires (10-15 mils) must be very tough to prevent damage during handling, installation, and use. Only high-density polyethylene offers the required combinations of electrical and mechanical properties, and is being specified exclusively by R.E.A. for this application today.

* * *

Many of you are aware of the development program under way in the Signal Corps Laboratories on the design of a four-conductor field wire. The problem was to design a four-conductor field wire which would be competitive in every way with the two-conductor, WD-1, field wire. The WD-1 wire is insulated with low-density polyethylene covered with a protective jacket of nylon. The approach to this problem has been to use high-density polyethylene without a jacket. The development work so far has been very promising. This is an excellent example of designing a product to exploit the unique properties of the insulating material.

* * *

Many other applications for high-density polyethylene are either under development or in the initial stages of commercial exploitation. These include: Foamed coaxial and communication cables, signal and control cables, flame-

proof formulations for high-temperature resistant house wire, and jackets for underground power and communication cables.

* * *

Several other applications have been overlooked, but those cited will serve to illustrate that high-density polyethylene is establishing itself as a top-quality insulation material. We confidently expect that the present applications will continue to increase in importance and that new applications will continue to be developed.

* * *

We would like to devote the second portion of this paper to an introduction of polypropylene as an insulation material for communication wire and cables. Perhaps this should have the title "Pro-fax Potentials in the Wire and Cable Industry", paraphrasing the introduction of Hi-fax three years ago, the situation is similar. Pro-fax (Hercules Powder Company's name for polypropylene) is today a newcomer to the wire and cable field just as Hi-fax high-density polyethylene was a newcomer three years ago.

* * *

What is polypropylene? The useful form of polypropylene is a crystalline, symmetrical polymer of the petroleum gas, propylene. Depending on the method of manufacture, it is possible to obtain polypropylenes varying in their degree of crystallinity. This will, of course, affect their properties. Also, polypropylene in the raw state is extremely susceptible to oxidation and must be properly stabilized. Stabilization is a jealously guarded proprietary art and will be likely to vary from manufacturer to manufacturer. The point we are leading up to is this: It would be misleading and unfair to present data which we have obtained on Pro-fax, the polypropylene manufactured by Hercules, as representative of all polypropylenes. Therefore, we will direct this discussion toward Pro-fax polypropylene specifically.

* * *

Pro-fax® polypropylene is manufactured by Hercules Powder Company by means of the Ziegler catalyst system. Several formulations are available, all based on the same polymer, but varying in type of stabilizer employed. Pro-fax 6511 is a general-purpose formulation; 6512 is stabilized for maximum resistance to embrittlement on exposure to high temperatures; 6513 has been submitted to F.D.A. for use in food-packaging applications; and 6514 is formulated for maximum U.V. resistance and is used in monofilament applications. The two formulations of greatest interest to wire and cable manufacturers are 6511 and 6512. Where long-time exposure to elevated temperature is required, 6512 is the preferred material.

* * *

The physical and electrical properties of Pro-fax are shown in Tables I and II. These properties are typical of both 6511 and 6512 formulations.

* * *

Pro-fax is the lightest of all thermoplastic materials; has a 333°F. melting point; is very resistant to deformation under load, even at elevated temperatures; and has a high flexural modulus. One of its most outstanding properties is a lack of susceptibility to environmental stress cracking.

* * *

The electrical properties are excellent, reflecting the general su-

(*Please turn to page* 650)

TABLE I

PHYSICAL PROPERTIES OF PRO-FAX® POLYPROPYLENE (INJECTION MOLDED SPECIMENS)

	ASTM Method (unless noted)	Data
GENERAL		
Crystalline melting point, °F.	birefringence	333
Specific gravity	D792-50	0.901
Mold shrinkage, in./in.	to room temp.	0.01-0.025
THERMAL PROPERTIES		
Yield stress at 212°F., p.s.i.	D638-56T (1)	1720
Tensile modulus at 212°F., p.s.i.	D638-56T (1)	37,000
Heat-distortion temperature (66 p.s.i.), °F.	D648-56	221
Heat-distortion temperature (264 p.s.i.), °F.	D648-56	140
Deformation under load, % (2,000 p.s.i., 6 hr. at 122°F.)	D621-51	2.0
Coefficient linear thermal expansion, in./in./°F.	D696-44	4.7×10^{-5} in./in. per °F. (-22 to + 77°F.)
Coefficient of cubic expansion, cu. in./cu.in./°F.	D864-52	1.4×10^{-4} cu.in./cu. in. per °F. (-22 to +77°F.)
MECHANICAL PROPERTIES at 73°F. and 50% R.H.		
Tensile strength, p.s.i.	D638-56T	5000
Tensile yield stress, p.s.i.	D638-56T (1)	5000
Tensile modulus, p.s.i.	D638-56T (1)	170,000
Tensile yield strain, %	D638-56T (1)	11-15
Ultimate elongation, %	D638-56T (1)	220
Stiffness in flexure, p.s.i.	D747-50	175,000
Flexural modulus, p.s.i.	D790-49T	170,000
Izod impact, ft. lb./in. notched	D256-56	1
Izod impact, ft. lb./in. unnotched	D256-56	33
Hardness, Rockwell R	D785-51	95
Abrasion resistance, CS 17 wheel, mg./1000 cycles	1044-54T	18-28
PERMANENCE PROPERTIES		
Water absorption, % (24-hr. immersion)	D570-54T	0.03
Environmental stress-cracking in 100% Igepal CO-630	Bell Lab's Method	None

(1) 0.2 in./min. crosshead speed

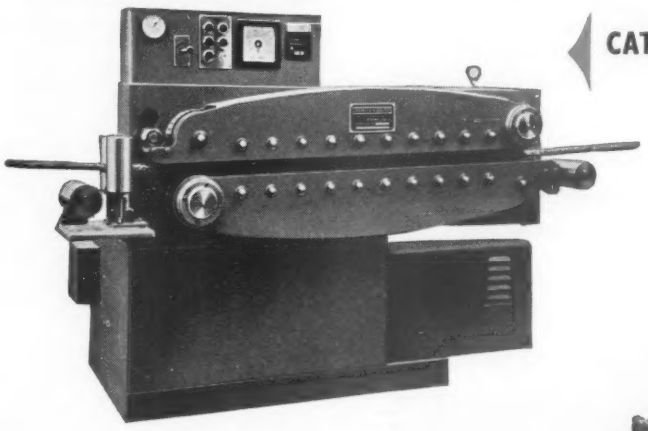
TABLE II

ELECTRICAL PROPERTIES OF PRO-FAX®

(UNPIGMENTED)

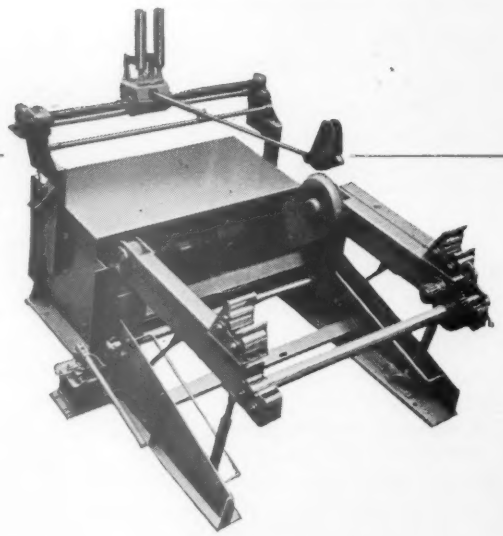
Dissipation Factor (ASTM D150-54T)	
10 kcs, 23°C.	.0013
50 mcs, 23°C.	.0005
10 kcs, 100°C.	.0010
Dielectric Constant (ASTM D150-54T)	
10 kcs, 23°C.	2.26
50 mcs, 23°C.	2.25
10 mcs, 100°C.	2.25
Volume Resistivity (ASTM D150-54T)	
23°C.	3×10^{17}
100°C.	8×10^{14}
Dielectric Strength (ASTM D149-55T)	
Step-by-step, v/mil (125 mil sample)	475
Arc Resistance (ASTM D497-48T)	
Seconds	180

NEW ANCILLARY MACHINES



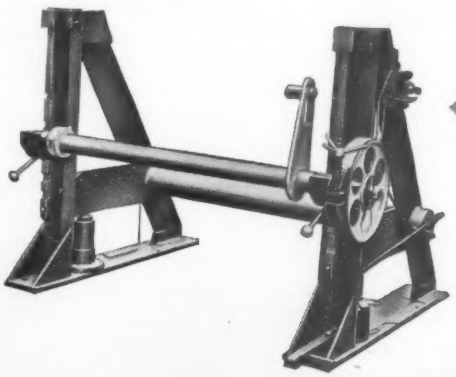
CATERPILLAR HAUL-OFF

With a direct in-line haul-off, this machine avoids excessive strain on the cable or damage to sheathing. By using endless belts with steel cores covered with rubber shoes to form a series of jaws, the caterpillars fully protect the cable during haul-off. Positive grip is effected hydraulically and remains constant throughout operation. Grip may be pre-selected and simply controlled. An instrument panel indicates grip pressure and driving speed.



INDEPENDENT TAKE-UP DRUM STAND

A new Independent "Take-up" Drum Stand provides a more versatile unit to cover a range of machines and to serve continuous production. A new traverse action guides the coils to the correct position and is fully automatic. Cable tension is electrically controlled and the pull can be pre-selected before starting up or adjusted during operation. The drive on the drum automatically holds the cable firmly in position when the production machine stops. A hydraulic system is provided for lifting and loading the drum.



HYDRAULIC PAY-OUT DRUMSTAND

The new L.B. Hydraulic Pay-Out Drumstand has been produced for quick adaptation for use with any stranding machines to carry an additional stranded core or lead-in wire. It is ideal for extruding lines. Hydraulic jacks do the lifting and lowering of drums. The tensioning device is independent of the through shaft to avoid constant dismantling. The Drumstand is made in five standard sizes and to increase the diversity of application, each stand is supplied with two shafts of differing diameters.

Designers and Manufacturers of machines for electric cable, wire rope and soft rope production.

LARMUTH & BULMER LIMITED

In association with Mono Pumps Ltd., J. E. Arnfield Ltd. Menrow Ltd. Carlisle Electrical Co. Ltd.

SALES OFFICE: UNWIN STREET, SALFORD 6, LANCASHIRE, ENGLAND

TELEPHONE NUMBERS: PENDLETON 1647/8/9

AGENTS IN SOUTH AFRICA: MONO PUMPS (AFRICA) (PTY) LIMITED, AUDENSHAW HOUSE, WENDALL STREET, LAKEVIEW, JOHANNESBURG. TELEPHONE: 33-1112/3
AGENTS IN AUSTRALIA: MONO PUMPS LIMITED, MONO HOUSE, 132 BURWOOD ROAD, BURWOOD, E.13, MELBOURNE, VICTORIA. TELEPHONE: BW. 0291
AGENTS IN CANADA: THE E. V. LARSON COMPANY LIMITED, 572 QUEEN STREET, EAST, TORONTO 2, ONTARIO. TELEPHONE: EMPIRE 4-2111

LB 10

Modern Continuous Belt Furnaces Harden Many Different Parts at High Production Rates

by Howard L. Hopkins
Assistant Works Manager and Chief Engineer
National Screw & Manufacturing Company
Cleveland, Ohio

This article describes the operation and effect of two new continuous belt furnaces that have provided great flexibility, lessened monitoring, and reduced maintenance.

Two continuous belt type heat treating furnaces are treating a wide range of parts. Our company makes over 40,000 different headed and threaded products. This completely integrated plant in Cleveland has practically 20 acres of floor space. Nearly 4000 units of production equipment are used to produce parts from hot rolled rod, through drawing, heading, machining and finishing. In addition to rivets, cotter pins, and tacks, the company produces over 21,000,000 bolts, nuts and screws per day. Most of the parts are treated in two 40 ft. long continuous belt type controlled atmosphere furnaces.

* * *

These furnaces, built by Surface Combustion Corporation, produce as much as 1,500 lbs. of heat treated parts per hour and have cut costs appreciably. Parts can be quenched in oil or water and under protection of neutral or carbon restoring atmosphere. Parts are produced clean or bright hardened according to requirements.

* * *

Twin Syntron feeders on each continuous furnace are used to feed the work to the totally enclosed, 3 ft. wide, 35/15 alloy, link belt. This assures uniform distribution of the parts across the width of the belt.

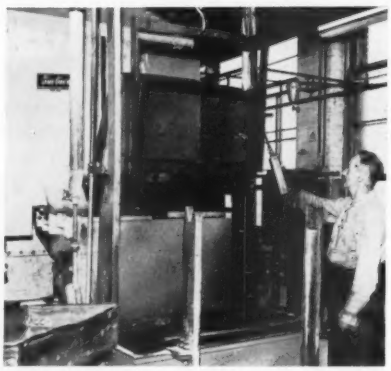


Figure 1 — Operator charging a load of bolts on the dual Syntron feeders. Work is placed in the elevator basket in a wash tank, where it is washed, elevated and automatically charged onto the feeders. * * * * *

* * *

Each furnace is heated by 12, "W" type. 35/15 alloy, Surface engineered eductor radiant tubes. Six tubes are placed horizontally above the belt, five are located horizontally below the belt, and one is positioned vertically at the exit end of the furnace wall. Parts drop from the belt, through a chute and into the quench tank. A continuous flight conveyor belt removes the parts from the quench and deposits them into a tempering basket.

* * *

This tempering basket is placed in a tank of water and soluble oil. The soluble oil solution tends to wash oil off the work when an oil quench is used. The solution also prevents rusting of the parts when water is the quenching medium.

* * *

Work which has been hardened is taken from the soluble oil solution and placed in any one of ten recirculating air draw furnaces. Two of the draw furnaces are relatively large, having a tempering basket dimension 48″ in diameter and 60″ in depth. The other eight draw furnaces are much smaller. The use of many individual draw furnaces adds considerable flexibility for tempering. The two larger tempering furnaces handle the greater portion of the high production load. One of the large draw furnaces is used for tempering up to 1000°F., the other for temperatures to 1250°F. Both furnaces are standard equipment.

* * *

The furnace used for higher temperature is supplied with atmosphere by a Surface 500 cfh MDX® gas generator. Most of the work tempered in this unit has to meet scale-free specifications. Therefore, when temperatures must exceed 1000°F., the generated gas is piped into the furnace to protect the surface of the parts. Also, the MDX generated gas provides a positive pressure within the furnace, especially when the burners are on "low fire."

(*Please turn to Page* 648)

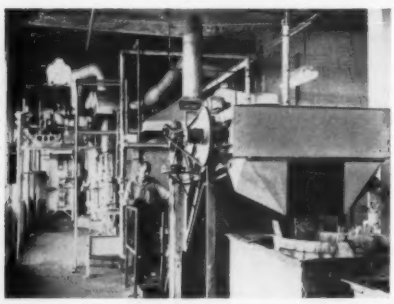


Figure 2 — A continuous flight conveyor belt removes the parts from the quench tank. Work drops off quench conveyor directly into the tempering basket in a tank of soluble oil and water. Soluble oil solution washes the oil quenched parts and coats the parts to prevent rusting of parts before tempering.

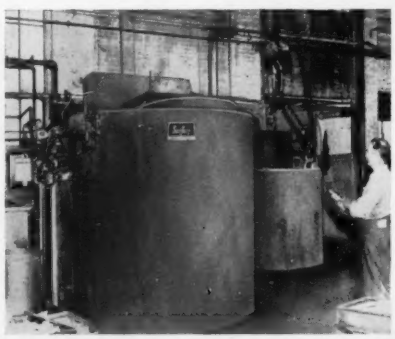


Figure 3 — Operator loading one of two large recirculating-air tempering furnaces. At temperatures over 1000°F. this furnace uses MDX® gas, to prevent scaling of the work.

Colloidal Graphite as a Lubricant in Wire Drawing

Translated by
Dr. Jerome W. Howe
Worcester, Massachusetts

This article originally appeared in the February issue of Draht-Welt and is published through the courtesy of the publishers of this magazine.

Colloidal graphite remains in adherence that is in a red-hot condition during drawing, and for that reason is useful in hot drawing.

* * *

For the drawing of tungsten and molybdenum wire a new drawing compound makes possible the drawing of fine tungsten wire. Formerly great difficulties were encountered due to wire breakage. Then it was found that the wire in red-hot state could be passed through a bath of the new compound, which bakes onto it. The wire was then drawn in the usual manner. The adhering thin film had excellent lubricating properties, and the former difficulties were completely eliminated. This process is used today with certain modifications.

* * *

In hot working, in which colloidal graphite is often added to the oil for increased lubrication, the rod is coated with a thin film of oxide. This oxide film is important, as the graphite is thus caused to adhere better to the wire.

* * *

After drawing, the wire often shows a gray color without the black sheen normally associated with the graphite. In order to secure good adherence of the graphite, for the renewal of the oxide film, the wire is drawn through a gas flame. After the heat treatment the wire, which has now a diameter of about 1 to 2 mm., is passed to the drawing benches. The afore-mentioned mixture is applied in the least possible quantity.

* * *

For the smallest diameter wires the graphite is added to the grease in somewhat greater concentrations than for drawing larger sizes. Commonly for the finishing sizes, one part of colloidal graphite is added to two or three parts of distilled water.

* * *

Before the wire is drawn through the die, it is passed through the dilute graphite solution, which is then burned on with the wire in red-hot condition, whereby both the surface quality and the efficiency of production are improved. As the drawing is usually done at temperatures of between 500 and 700 degrees centigrade, the colloidal graphite constitutes an ideal lubricant. The process for this resembles that for the drawing of molybdenum and tungsten. Bars and coils can also be dipped in the solution. Coils must be carefully dried to prevent the adhering film from coming loose. Before drawing, the wire is usually passed through a salt or lead bath in order to raise it to the required temperature.

* * *

Colloidal graphite can also be used in cold drawing with good effect. A specially prepared stearic acid mixture of graphite-aluminum powder serves for the drawing of high strength steels for the manufacture of bolts. The drawing leaves on the surface of the wire the thinnest possible coating of adhering graphite, which constitutes an excellent lubricant for subsequent upsetting. By this means the wear and tear of the bottom dies is prevented.

A Special Invitation to Our Readers

You who are not now members of the Wire Association, but who are engaged in the production of rods, wire, wire products and electric wire and cable, are extended a cordial invitation to become a member of the Association and join others in promoting and furthering the interests of our industry.

A booklet describing the functions of the Association and a membership application will be sent to you upon request.

THE WIRE ASSOCIATION
RICHARD E. BROWN, Executive Secretary
453 MAIN STREET STAMFORD, CONN.

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COLD HEADING MACHINERY
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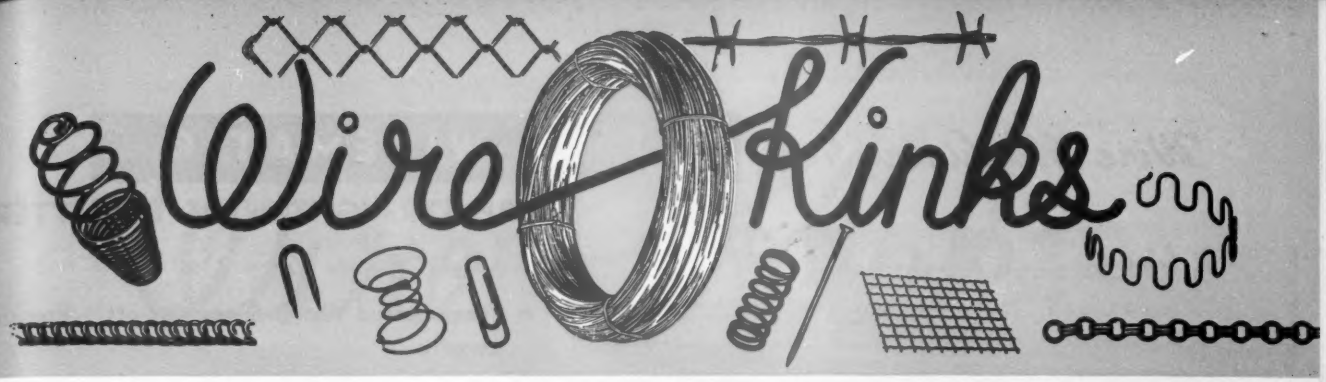


In this department will be published helpful hints on how to do things and the questions asked by our readers on wire processing problems, together with the answers and comments thereon received from the field. In no instance will the identity of the persons asking for advice or of those supplying it be published.

Our readers are invited to send helpful contributions and to submit questions on their technical problems to the Editor. These will be answered from information on hand or from the field, when it becomes necessary to secure counsel from that source.

Continuous Casting of Aluminum Rod

QUESTION

Could you let me have a brief run-down on the new continuous method of casting aluminum rod, to which I have seen some references?

ANSWER

The old expression "Roll your own" is graphically illustrated in the aluminum end of the wire industry through the growing use of continuous rod casting and rolling of aluminum rod.

* * *

While perhaps the best known process is the one developed by **Ilario Properzi** of Milan, Italy, and brought to a high degree of perfection by **Nichols Wire and Aluminum Company** in Davenport, Iowa, there have been a number of other European and American concerns who have entered the field with equipment for this purpose.

* * *

The process starts with aluminum pig or ingot and by melting these in an atmosphere furnace, the hot metal can be cast and rolled continuously into rod for subsequent drawing by individual wire plants in equipment that is relatively inexpensive, as compared with a conventional rod mill.

* * *

Advantages claimed are that it by-passes the casting of billets, their reheating, and enables the production of very large rod bundles having no butt-welded joints, thus increasing the efficiency of the drawing of rod into wire.

* * *

The process is said to be particularly desirable for those independent mills who consume important qualities of electrical grade aluminum wire in the manufacture of conductor wire and cable.

Measuring Die Contours

QUESTION

Is there a practical and quick method of determining whether dies have the proper contours? Your advice will be appreciated.

ANSWER

Tungsten carbide dies, regardless of the bell angle, entrance angle and length of bearing usually are checked by various methods to determine that they conform to specifications.

* * *

A method that has been found useful is to close up the back of the die with modeling clay and force some hard dental, inlay-casting wax that has been softened over a small flame into the die cavity, allowing it to remain a few moments to harden, and withdrawing the impression.

* * *

Visual inspection of the contour is then possible, but if a magnification of the wax impression is desired, a photographic microscope or a shadograph can give up to a 100X picture of the profile pattern. Greater magnification serves no useful purpose. This method is particularly good for dies of 5/64 inch hole diameter and smaller.

Development of Suitable Lubricants

In days long passed a wire drawer mixed his own lubricants and, if they worked satisfactorily, guarded his empirical formula jealously, keeping it secret from even his fellow workers. Such mixtures might contain anything he could find that looked as though it had good lubricating qualities.

* * *

Very commonly he removed all of it from the die bores at the end of his shift and took it home, just as he did his working tools, especially if his concoction was producing good wire.

* * *

A later development was that plant management devised and mixed large batches of wire drawing lubricants for the use of the machine operators, with different formulas for the various kinds of wire drawn in the mill. The use of one of these lubricants was specified on each order. This improved uniformity and gave better assurance that a specified finish would be produced. It was, however, largely an empirical procedure.

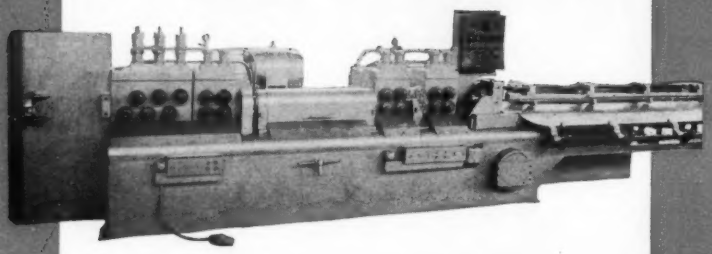
* * *

Today practically all wire mills purchase their lubricants from one or another of those specialists who make a business of developing highly specialized types of compounds for the great variety of wire and drawing conditions encountered. These specialists have research and development laboratories manned by top-notch technicians who are constantly working to provide better compounds for specific applications.

Wire Machinery Inc.

11-FM WIREMATIC

WIRE STRAIGHTENERS & CUTTERS



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- **Synchronized** Flying Shear Cut-off. Precision Lengths.
- **All Steel** Welded Base.
- **Processes** Entire Coil, End-to-End.
- **Longer** Dies. Greater Die Distance.
- **Especially Designed** Safety Features.

DUST AND SCALE AIR-SUCTION PULL OUT SYSTEM BUILT INTO MACHINE AS INTEGRAL PART

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Offers

CUSTOM DESIGNED MACHINERY

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OUR STRAIGHT-LINE DESCALING AUTOMATES WIRE DRAWING LINES. WE WILL SHOW YOU SUBSTANTIAL SAVINGS IN TIME AND LABOR.

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CHICAGO 32, ILLINOIS
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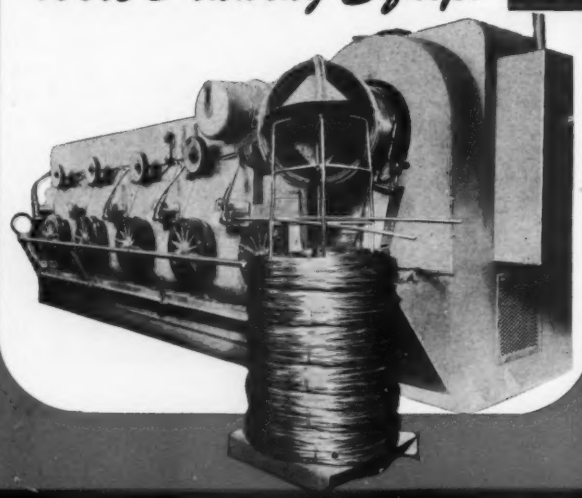
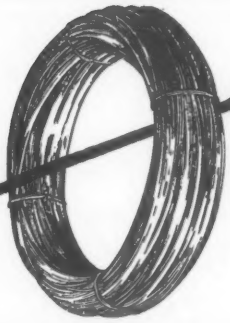
Wire Drawing Equip.

SIDEWINDERS - BULL BLOCKS



- ★ **Gives High Speeds** and High Quality Results.
- ★ **All Electrical** Equipment included Pre-wired Controls.
- ★ **Heavyweight** Coils – Low Power Costs.
- ★ **Easy** to Install.
- ★ **Compact.**
- ★ **Self-Contained.**

Wire Kinks



Many of the developments come about as a result of drawing problems put up to them by mill men who are not satisfied with what they are using. These proprietary compound producers have relieved the mills of burdens they are not equipped to handle and they have done much to make possible the utilization of the greatly increased machine capabilities.

Drawing and Annealing Copper Wire

QUESTION

We would appreciate learning something regarding American practice in the drawing and annealing of copper wire. Can you provide us with information on this subject?

ANSWER

In this country it is customary to draw copper wire from rod right down to the fine finished size without intermediate annealing. The copper, being highly ductile, permits this practice, although it results in a hard drawn wire that then requires annealing before being processed into electrical conductors.

* * *

Some mills do use intermediate annealing, drawing to coarse fine sizes of .025" to .016", annealing, and then drawing to double 0 sizes on a fine wire machine. A number of mills drawing wire to be enameled will depend on the heat of the enameling ovens to provide the necessary softness in the wire, although this is not possible where synthetic enamels are used to coat the wire.

However, the wire usually is drawn continuously from 1/4" or 5/16" diameter rod to .001". This is the practice in most large mills. Subsequent annealing is done in two general types of furnaces — the bell type and the continuous type. Equipment is available today for drawing, annealing and spooling continuously in one line and other equipment has been developed that will draw, anneal and enamel in a single continuous train of operations.

Hot Wire Drawing

QUESTION

In the March, 1959, issue of Wire and Wire Products on page 326 is a reference as follows: "A 26" Hot Wire Drawing Block is installed with infinitely variable speed between 50 and 200 feet per minute. High speed steel wire is heated through a graphite bath, baking oven and lead bath furnace."

* * *

If possible, we would appreciate any additional details you can provide concerning this process, and especially those covering the hot block.

ANSWER

We are glad to give you general information on the process in question as follows:

1. The wire or rod is generally run on an "in-line" plant, the first stage being a dip in an aqueous graphite solution at room temperature. This coating has a two-fold purpose in that it prevents "pick up" of lead during heating and also acts as a drawing lubricant.

2. The wire is then baked in an air circulating oven to dry the graphite coat before passing into a lead bath.

3. The wire is heated in a lead bath to 450-500°C. depending on the quality of the material being drawn.

4. The wire or rod is then drawn through a tungsten carbide die and coiled in the normal way on the block. As far as we know the only lubricant used in this type of work is graphite and generally the initial coating is sufficient to allow the wire to be drawn through the die. The material is usually annealed between passes and the whole process is repeated for each pass.

Viscosity Control of Wire Enamels

QUESTION

We would be interested to learn something about the manner in which viscosity control equipment functions and will appreciate your providing us with such information, if you can.

ANSWER

In the manufacture of magnet wire it is necessary that the viscosity of the wire enamel be controlled if applications of coatings are to be uniform. Various devices have been developed for this specific purpose.

* * *

One mill has developed a method in which the enamel is taken from the process reservoir at constant pressure and temperature through the use of a constant pressure pump. The only variable here would be a change in the solid

(*Please turn to Page* 655)

California Calls You to the

WEST COAST REGIONAL MEETING of THE WIRE ASSOCIATION

to be held

June 9-10, 1960 — STATLER-HILTON HOTEL — LOS ANGELES, CALIFORNIA

General Program Chairman

Joseph F. Conlan, President

City Wire & Iron Works, Inc., Los Angeles, Calif.

THURSDAY, JUNE 9

10:00 A.M. to 2:00 P.M. — Registration — The Garden Room

10:30 A.M. to 1:30 P.M. — Directors' Meeting and Luncheon

2:00 P.M. — Technical Session — The Garden Room

Moderators

Clyde Wilson, Wire Sales, Bethlehem Steel Co., Pacific Coast Div. and R. Ward Dobbins, Purchasing Agent, Simmons Co., San Francisco.

PAPER: "Story of Lubrication" — by Robert Piper, Industrial Compounds Co., & Brooks Oil Co.

PAPER: "How Deadblocks Increase Wire Mill Production" — by Ray Hulen, Chief Eng., Whitacre Engineering & Manufacturing Co.

PAPER: "Cable — World Wide Today" — by E. H. Lewis, Pres., Western Insulated Wire Co., Los Angeles.

PAPER: "The New Nickel Alloys in Wire for Special Applications" — by Kenneth P. Brown, Commodity Specialist, Pacific Metals Co.

FILM: "The Story of Cerro Bolivar" — shown through the courtesy of Columbia-Geneva Steel Div., United States Steel Corp. Film depicts the ore mining operations at Bolivar.

FRIDAY, JUNE 10

8:30 to 9:30 A.M. — Registration and Plant Inspection Tours.

9:30 A.M. — Cars leave hotel to visit the American Brass Company's plant in Paramount, Calif.

1:00 P.M. — Luncheon at plant of the K. H. Davis Wire & Cable Corp. through the courtesy of that company.

2:00 P.M. — Tour of K. H. Davis Wire & Cable Corp. plant.

6:30 to 7:30 P.M. — Cocktail Hour — Los Angeles Room — as the guests of the Pacific Coast Div., Bethlehem Steel Co.; The Colorado Fuel & Iron Corp.; Columbia-Geneva Steel Div., U. S. Steel Corp.; and The Planett Manufacturing Co.

7:30 P.M. — Dinner — Golden State Room — Door prizes distributed.

MASTER OF CEREMONIES — Earl R. Potter, Pres. of Industrial Wire Products Corp., Los Angeles.

SPEAKER: Dr. Jose Fernando Matchado, who will talk on "Relations Between the two Americas."

THE COST: Registration and Dinner . . $10.00

Ladies Dinner Tickets . . $10.00

OTHER ATTRACTIONS: The Program Committee will advise of things to do following the meeting, such as trips to Disneyland, Las Vegas, shows, etc. Be sure to attend.

THE WIRE ASSOCIATION

Richard E. Brown, Executive Secretary

453 Main Street **Stamford, Conn.**

Flat Wires for Electrical and Mechanical Applications

An extensive line of rolled and flattened wires in a wide variety of metals is offered by the **Hudson Wire Company,** Ossining, N. Y., for electrical, mechanical and decorative purposes.

* * *

For use in abrasive applications, Hudson offers wires for metal sponges, filters, abrasive wools, and household metal-cleaning pads. Rolled from .007" to .0045" round wire of copper, bronze (85/15 and 90/10), brass (70/30 and 80/20), nickel silver (10%, 12%, and 18%), Monel, and aluminum.

* * *

Hudson also produces tinsel in diameters from #16 to #26 in false gold, bare and silver-plated copper, and bare and silver-plated cadmium copper for wearing or decorative purposes.

* * *

Electrical and mechanical applications include such uses as shielding braids, electric blanket conductors, tinsel cord conductors and packing material.

* * *

Complete details are available from Hudson upon request.

Molybdenum Mill Products Specifications

The Refractomet Division of **Universal-Cyclops Steel Corporation,** Bridgeville, Pa., has announced the publication and availability of a new molybdenum mill products specifications booklet. The release of this compilation marks the first time a manufacturer has made available such information to users of molybdenum products.

* * *

The booklet covers unalloyed molybdenum and Mo-0.5 Ti alloy billets, bars, plates and sheets. Material specifications for each of these standard mill products include: scope, manufacture, chemical composition, structure, mechanical properties, dimensions, finish, inspection and other information.

* * *

The Refractomet Division produces molybdenum , columbium, tantalum, and is a major conversion source of titanium and zirconium in all standard mill forms.

New Welding Wire Firm

American Alloys, Inc., a new manufacturer of automatic and cut alloy welding wire, has opened plant facilities at Newark, California, near San Francisco.

* * *

Edwin M. Westendarp, president, announced the firm has completed construction of a modern 15,000-square foot plant building and is now making shipments to customers throughout the U. S. **Milton Sims** is Vice President and **James Stitch** is Plant Superintendent.

* * *

The company's products include aluminum, stainless, magnesium, copper base and titanium alloy wires in spooled, coiled and cut

LEGEND LARGE AND CLEAR ON INSULATED WIRE SURFACES —— USE GILLIES MARKING

GILLIES CONCAVE AND FLAT MARKING WHEELS PRINT YOUR

WHEELS AND MACHINES FOR BEST WIRE IDENTIFICATION

MARKING WHEELS and MACHINES for ELECTRIC WIRE

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Gillies Engraved Concave and flat marking wheels are widely used printing the I.P.C.E.A. color code, numerical, semi-spiral striped, dating, or manufacturer's identification, etc. on insulated wire, tubing or hose.

Machines print on ONE or BOTH SIDES in large legible letters. Wheels are adaptable to any machine—or we will supply the machines.

Wheels, shafts, ink pans and all accessories are readily removable for quick and easy cleaning.

Wheels are made of TOOL STEEL, HARDENED to Rockwell test 61-64 and HARD CHROME PLATED.

Send for samples of wire and prices on wheels and equipment.

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Tell us your wire or wire handling problem. You can be sure that Apco has the answer that makes real sense. Prompt delivery, too.
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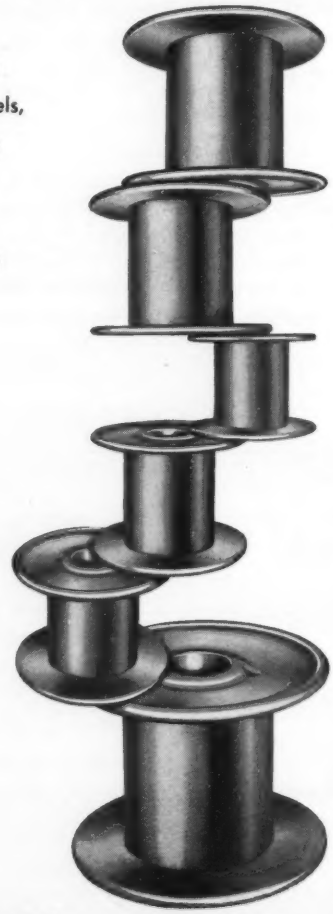

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lengths, and coated aluminum arc welding electrodes. Amerloy, Inc., is the Sales Division of American Alloys, Inc.

Techalloy Installs New Equipment

Techalloy Company, Inc., Rahns, Pa., has placed orders for one million dollars worth of New Strip Mill equipment. **Waterbury Farrel** was awarded contract to build a 17" wide Sendzmir Mill for rolling Stainless steels, Monel, Nickel, Inconel, Inconel "X", Ni-Span C and other heat resisting alloys along with Electrical Resisting alloys from .062" to .001" thick in widths to 14". Mill to be fully equipped with automatic controls for controlling thickness to tolerances of .00002". General Electric will supply their all new electrical controls and motor generator sets specially designed with wide range of tension control for rolling foil less than 1/3 thickness of human hair.

* * *

Two new 17" wide slitting lines will be supplied by **Ruesch Machine Co.** Slitters specially designed to slit as small as .001" x 3/32".

* * *

Terminal take up equipment for twin bright hydrogen strand annealing furnaces will be supplied by **Herr Equipment Co.** All facilities outlined above to handle 3,000 lbs. coils which weigh 200 lbs./inch.

* * *

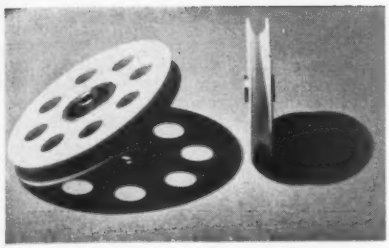
New building and foundations for the above equipment are now completed.

New Ceramic Pulleys for Wire

American Lava Corporation, Chattanooga 5, Tenn. has developed a series of ceramic pulleys with ball bearings which are claimed to be superior to conventional metal or fiber pulleys now in general use in the wire industry. Higher resistance to wear from abrasion and to corrosion by strong acids account for this superiority. The ceramic also exhibits high resistance to elevated temperature failure. Pulley sizes tested to date range from 1¼" O.D. to 3" O.D.

* * *

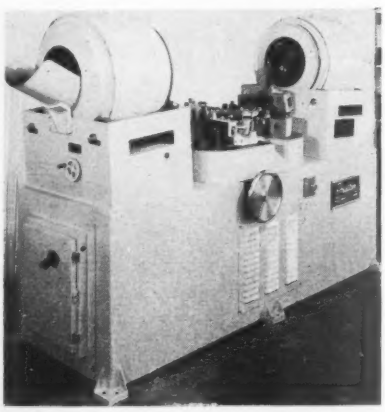
Applications include guide pulley for continuous annealing on fine



wire drawing machines; take-up traverse guide from hot dip tank and many others. Write for further details.

New Machine Threads Two Sizes At Once

In a statement by **Les W. Schaffer,** Vice President of **Prutton Corporation** he said "ten years ago, the way was opened for high production speeds in thread rolling when **Daniel H. Prutton** pioneered the first planetary thread rolling machine. Production speeds of 600 to 800 pieces per minute are now easily possible." Since the newest Prutton machine has two hoppers, users can run two different blank stock lengths simultaneously. All work is class 3 fit and the machine is designed to operate one side at a time if desired. The parts are kept separate with a different part leaving each side of the thread roller.



The model 125A-24 planetary thread rolling machine rolls screws, bolts and nails. It handles over-all blank stock lengths up to 3 inches and diameters up to 5/16". Other operations performed are roll forming, knurling, marking, serrating and necking. For complete information on this machine, write Prutton Corp., 5295 W. 130th St., Cleveland 30, Ohio.

For Fungus Resistance, Specify

TEXTILENE TWI-TAR

Offering great durability along with light weight, Textilene Twi-Tar is successfully used for buried communication cable (bedding and overall serving), expanded ACSR cable (expander between core and conductors), stationary power cable and portable cables.

Twitchell's superior Textilene line also includes: Moisture-resistant fillers — *Twi-Flex* and *Twi-Wax*. Used for non-metallic sheathed cable, maritime shipboard cable, varnished cambric cable.

Soft, dry fillers — *Twi-Port* and *Glascor** (Fiberglas-centered for high tensile strength without added bulk). Used for control, power, appliance, coaxial and communications cables, and all types of portable and flexible cords.

*Patent Applied For

For Every Wire and Cable Application
Twitchell's TEXTILENE Fillers Fill The Bill

Quality-controlled materials that are dependably uniform . . . in standard forms, or customized to special needs.

Initial low cost with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

Assured supply from a reliable domestic source . . . always available in economical and convenient packaging.

Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation—also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

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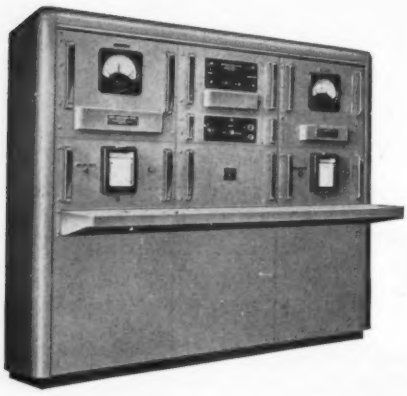
In use in over 200 Cable plants—and in more than 30 countries



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Small Impregnation Control Station for 3 Vacuum Impregnation Tanks

Ingenious system of building blocks permits extension, modification, and assembly of hundreds of different combinations of Control stations, to individual requirements, at moderate cost.

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428/3

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Hot drawing lubricants

Anon. Indian Wire Industr 1959 Vol 11 (12) p 170 (Dec)

'Dag' Colloidal Graphite, claimed to be the only lubricant which will adhere to metals at red heat, is widely used for all hot drawing operations. Its uses when drawing tungsten, molybdenum, and steel are described. The Acquadag mixture is used to lubricate tungsten wire down to the finest sizes; for the finest drawing through diamond dies, the concentration of the mixture in the lubricant is slightly higher than for coarser wires.

Six-spindle polishing machine.
Sechspindlige Poliermaschine

Anon. Draht 1960 Vol 11 (1) p 32 (Jan) (In German)

A six-spindle polishing machine to be used for diamond dies of 1.5 mm to 0.050 mm diameter is discussed. The dies are rotated upon die-holders while the polishing needles move up and down. 1 illustr.

Estimating a draw die

P. Prikos. Mach Tool Blue Bk 1960 (1) pp 102-104 (Jan) 2 illustr.

USP 2,899,747 (June 27, 1955) **J. T. Weir, US Steel Corp**

Method of measuring the bearing length of drawing dies

The length of the bearing section of a finished wire drawing die has usually been determined by visual inspection without uniform accurate measurement, although the measurement of entrance and back relief angles has been assisted by some mechanical devices and optical apparatus. It is, however, possible to find the bearing surface length of a die with a conventional optical measuring instrument even though it may be a matter of 0.0001 in. only in many instances. In Fig. 27, 2 is a monocular microscope with a screw micrometer 4 on the eyepiece which moves a cross-hair over a small scale 6. The die W is mounted at an angle on holder 8 of a micrometer microscope stage 10. The bearing surface is illuminated by 12. The inclination of the die is preferably 30 degrees. The length B is determined by measuring length A on the microscope scale and

applying the sine formula Sine $\theta = \frac{A}{B}$ (1 claim, 1 illustr). Ref cited: 4 USP; "Instruments" 1947.

Diamond drawing dies for wire drawing.
Diamant-Ziehsteine zum Ziehen von Draehten

W. Rittmeier. Maschinenmarkt 1957 Vol 63 (101) pp 15-16; Tech- Wiss Ber Osram 1959 Vol 31 (11/12) p 200 (Oct 15) (In German)

On the results of research into the evaluation of diamond drawing dies the requirements for satisfactory drawing dies are stated. The structure of dies for special application, their advantages, such as resistance to bursting and wear, as well as the setting and polishing thereof, are described.

Drawing titanium and zirconium wire

R. Knight. Wire & Wire Prod 1959 Vol 34 (11) pp 1504-1505, 1547 (Nov) 2 tables.

Cooling in wire drawing machines.

Kuehling an Draht-ziehmaschinen

H. Sedlaczek, K. Becker. VDI Zeits 1959 Vol 101 (30) pp 1385-1389 (Oct 21) (In German)

Friction between wire and die as well as the deformation of the wire cause high temperatures which increase faster at higher speeds of drawing because there is no adequate means of reducing the temperature at high drawing speeds. Lubricants and coolants reduce friction and temperature, the type of fluid as well as the type of spray being influential factors. Various methods of measuring temperature within the die have been evolved. To cool the wire a current of cold air may be blown on to it or a cooling fluid may be run over it outside the die. To reduce the temperature within the die a coolant may be run through the die-holder itself.

Certain machines are designed for dry drawing and a dry lubricant must be used. 13 illustr, 8 ref.

Resilient buffing wheels for precision potentiometers and instruments

K. F. Shrubb (Elliott Bros (London) Ltd). Instr Pract 1959 Vol 13 (8) pp 824-829 (Aug); (9) pp 932-939 (Sep)

Describes methods of buffing insulating coatings from electrical resistance wires to make contact tracks on potentiometers, in which a selected abrasive was used as a filler in a friable elastic bonding medium. These methods are markedly superior to conventional ones, the contour of the wire being closely preserved and a high burnish left on all gauges of resistance wire down to 0.0005 in. diameter, the finest commercially available. Attention is drawn to the importance of melting point as well as hardness, and suggestions for suitable abrasives are made in the light of these factors. A Tomlinson recorder profile of a potentiometer, 0 0016 in. diameter enamelled nickel-chromium close wound, buffed with a pvc-bonded chalk filled wheel, was taken with a 90° V-shaped diamond stylus with a tip radius of between 0.0001 to 0.0002 inch. 5 Illustr, 10 ref, 5 tables.

* * *

Drilling and rough polishing machine for diamond and sintered carbide drawing dies.

Bohr- und Vorpoliermaschine fuer Diamant- und Hartmetallziehsteine

Anon. Draht 1959 Vol 10 (11) p 596 (Nov) (In German)

The Soldixa type KS 10/6 with six spindles will machine diamond dies of 0.030 mm to 1.5 mm diameter and sintered carbide dies of 0.08 mm to 2 mm. It consists primarily of the control box,

Your best buy...

124-INCH DIAMETER
50 TON CAPACITY
STEEL REEL
for oil filled cable

BETTER QUALITY
LONGER LASTING

NYECO

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ASSURE SAFE DELIVERY of your cable with rugged, weather resistant, splinter-proof NYECO steel reels. Protects costly cable against damage in shipping and processing due to dropping, bouncing, rough handling. Costs little more than wooden reels... lasts up to 10 times longer... requires minimum maintenance.

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ANY QUANTITY — ANY SIZE — ANY FLANGE DIAMETER from 42" up

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EXAMPLE

FIREPLACE CURTAIN SCREEN WIRE

The beauty and smooth operation of fireplace curtain screens depend on accurate forming, even spacing, and neat appearance of the mesh. The wire used must be of correct temper, diameter and finish. Uniformity of these properties is of prime importance. Leading fireplace equipment makers choose Continental Wire because it possesses these features dependably, in coil after coil. The ability to take intricate forming is an important reason why Continental Wire is specified for scores and scores of other products made with wire. Continental Curtain Screen wire, 19 gauge through 20 gauge inclusive in size, is available in 500 pound to 650 pound catchweight single length coils packed in Leverpac Drums for faster weaving with less down time, cleaner handling and better storage. For wire in practically any size, finish, temper or analysis, in low or medium low carbon steels, see Continental first!

Fine Finishes in Manufacturers' Wire

CONTINENTAL STEEL CORPORATION

KOKOMO • INDIANA

PRODUCERS OF: Manufacturers' Wire in many sizes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright and special shaped wire. Also Welded Wire Reinforcing Fabric Nails, Continental Chain Link Fence, and other products.

housing the motor drive for the die plates, which are on ball bearings, and the headpiece. On the headpiece, at the back end, is the bearing for the eccentric shaft which is driven by the motor, and in front of this are the needle bearings. The turning motion of the shaft causes the up-and-down movement of the needles. Special collets ensure that the needle is firmly gripped in the holder, and this is held under the pressure of an adjustable spring. A control screw determines the position of the needle in accordance with the conditions and finish required. For a perfectly conical drilling and polishing process the needles must be ground mechanically on special conical grinding machines (Type KS 19a). 1 illustr.

Durability of diamond drawing dies for the production of ultra-thin wires.
Haltbarkeit von Diamantziehsteinen zur Herstellung von mikronenduennem Draht

G. P. Gwosdyk, N. F. Andrianow. Stahl 1958 (9) pp 839-842; abstr in Draht 1959 Vol 10 (12) p 683 (Dec) (Abstr in German)

The results of various tests on resistance alloys of high and low carbon content to find the durability of diamond drawing dies are given in detail. The higher the annealing temperature and drawing speed, the less the non-viscous elements in the metal and the smaller the diameter of the wire, the greater will be the durability of the drawing die. When first used the durability of drawing dies is noticeably lower but it increases with further use and with higher drawing speed. Durability is greater on small reductions, but a greater number of drawing dies must be used.

"Properties and Uses of Commercially Available Cobalt Compounds"

In response to inquiries, the **Cobalt Information** Center has prepared a listing of commercially available cobalt compounds.

* * *

This two-page summary lists 46 organic and inorganic compounds, including the new potassium cobalticyanide, and provides information on their uses, formula, per cent cobalt, molecular weight, specific gravity, crystalline form, melting point, and solubility.

* * *

The list will be sent to persons addressing requests on company letterhead to the Cobalt Information Center, c/o Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio. Requesters abroad should write to Centre d'Information du Cobalt, 35, rue des Colonies, Brussels, Belgium.

Outstanding Personalities of the Wire Industry

Chase Brass Promotions

In a series of related promotions, **Herman H. Kremer** was elected Vice President in Charge of Sales and Director for **Chase Brass & Copper Co., Inc.,** a subsidiary of Kennecott Copper Corporation. **Walter E. Evans** has been named Assistant to the President. **Paul M. Thomas** has been appointed General Sales Manager. The appointments were announced by **Glenn P. Bakken,** President of Chase.

New Specialty Wire Mill Established

Michael J. Nelson has announced the recent establishment of **Metronics, Inc.,** to mass produce tungsten and molybdenum rod, wire and electrodes; tantalum and columbium rod and wire; and a variety of special alloys. General offices and manufacturing facilities are located at 240 Humphrey St., Englewood, N. J.

* * *

Metronics, Inc. was formed as a result of an extensive study which developed the existence of an unfilled need for specialized metallurgical products and facilities to serve the growing requirements of the automotive, electrical, electronic, aircraft, missile and metalworking industries.

Seated, L. to R.: Mr. Hynes and Mr. Nelson. Standing, L. to R.: Mr. Gensheimer and Mr. Touhey.

* * *

Mr. Nelson, President, served for 18 years as Assistant to the Executive Vice President of Wah Chang Corporation, where he introduced tantalum, columbium, zirconium and hafnium into its operations.

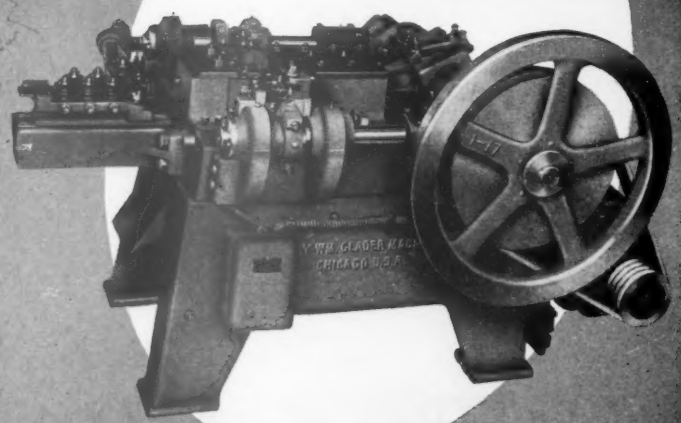
* * *

Robert V. Gensheimer, Vice President, was formerly manager of the Wire Department at Callite Tungsten Corp., where he served for 12 years. During the past ten years, he has been associated in an executive capacity with another leading producer of tungsten and molybdenum products.

* * *

Patrick K. Hynes, Vice President, served for the past seven years with Wah Chang Corporation in charge of their Little Ferry and Union City, N. J., facilities. Prior to that, he was manager of the Rod Department at Callite

high efficiency — low cost
with GLADER wire nail machines



Eliminate costly down-time in the Nail Mill by replacing obsolete machines with new GLADER NAIL MACHINES . . . For tops in efficiency and economical operation use GLADERS.

WM. GLADER
MACHINE WORKS

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EXPORT DEPT., 122 EAST 42ND STREET, NEW YORK 17, N. Y.

Tungsten and as a manager of one of Sylvania Electric's production facilities in Towanda, Pa.

* * *

William O. Touhey, Secretary-Treasurer, was employed for several years by the Electrometallurgical Division of Union Carbide Corporation, Niagara Falls, New York, and for 14 years by Kennametal, Inc., Latrobe, Pa.

McCarthy Advanced by U.S.I.

Donald O. McCarthy has been named Assistant Production Manager for Petrothene polyethylene resins by **U. S. Industrial Chemicals Co.,** Division of National Distillers and Chemical Corp. The appointment was announced by Paul J. LaMarche, Director of Production.

* * *

Mr. McCarthy joined U.S.I. in 1956 as a Technologist at the company's Tuscola, Illinois plant. At the time he was appointed to his new position, he was an Area Superintendent.

New Sales Manager For Scott Testers

The appointment of **Rolla H. Taylor** as Sales Manager for **Scott Testers, Inc.,** manufacturers of a broad line of physical testing equipment, has been made by **President David C. Scott, Jr.** Mr. Taylor has been with Scott since 1953—first as sales engineer, and since 1958, as assistant sales manager. His experience, particularly in the field of elastomeric technology, has been broad, including some 20 years with the National Bureau of Standards as rubber technologist. In his new sales management capacity, Mr. Taylor will have charge of sales of Scott testing equipment to the rubber, textiles, paper, leather, plastics, wire, and leather industries throughout the U. S. and in over 60 foreign countries.

Tevco Announces Changes

Nat B. Kaufman, President of **Tevco Insulated Wire** announces the recent acquisition of this extruded plastics wire manufacturing company. Associated with him is **Bernard Nelson,** Secretary and General Sales Manager; and **Rolland Trombley,** Vice President and General Plant Manager.

* * *

Mr. Trombley for the past 18 years has been associated with Cornish Wire, Rockbestos, Revere, Ansonia, Hy Temp., etc. His wide experience in the wire field adds tremendously to the technical staffing of Tevco. Plans are now set for a new expansion program coordinating new plant machinery and equipment for plastic insulated wire, wire harnessing and jacketing.

Oman and Smith Promoted by U.S.I.

Clifford E. Oman has been named Assistant to the Director of Production at **U. S. Industrial Chemicals Co.,** Division of National Distillers and Chemical Corporation. In his new position he will report to Paul J. LaMarche,

MARKING MACHINES and INKS

FOR INSULATED WIRE, TUBING AND PIPE—

Type AM — Illustrated has these features:

1. FINE VERTICAL AND HORIZONTAL ADJUSTMENTS PROVIDE PERFECT MARKING ON WIRES OF .010" TO 3.00" IN DIAMETER.
2. ACCOMMODATES FLAT, CONCAVE, OR SPECIAL WHEELS.
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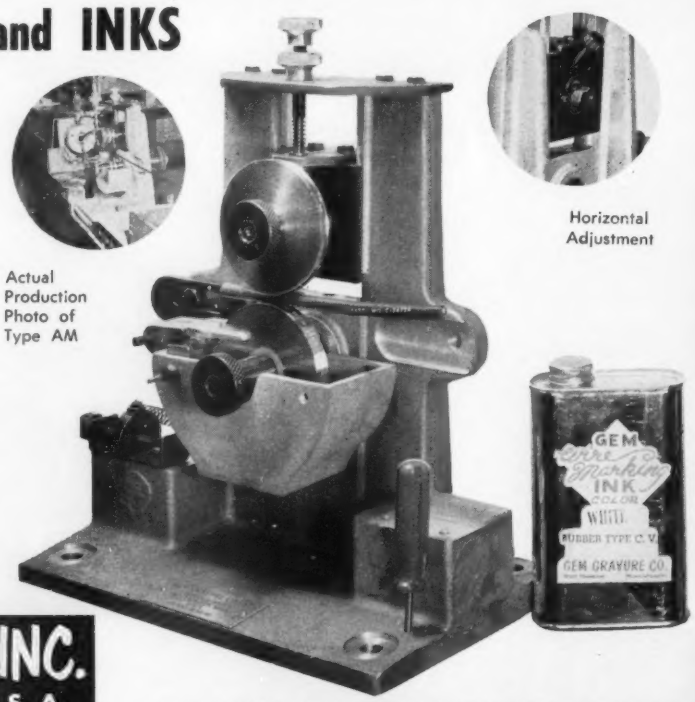

Actual Production Photo of Type AM

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GEM GRAVURE CO., INC.
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IN THE MARKING OF EXTRUDED MATERIAL THERE ARE BIG ADVANTAGES IN ONE SINGLE SOURCE OF SUPPLY.

KNOW-HOW • INKS • WHEELS • MACHINES

Director of Production.

* * *

Mr. Oman had been Tuscola General Manager with responsibility for operations at U.S.I.'s petrochemcial plant complex at Tuscola, Ill. He joined the staff in 1951 as an area superintendent. He holds a Bachelor of Chemical Engineering degree from the University of Minnesota.

* * *

James R. Smith, Plant Manager, now assumes full responsibility for Tuscola plant operations. Mr. Smith had been Plant Manager of U.S.I.'s Caustic-Chlorine Plant at Huntsville, Alabama from 1951 until 1957. He also served as Plant Manager of U.S.I.'s Zirconium-Titanium metals plant and as a Production Manager in the New York headquarters before his transfer to Tuscola last year. He obtained his engineering education at Edwards School of Chemistry and Engineering and the Murray State College in Kentucky.

Sleeper & Hartley Names Russell Vice President

Frank S. Russell has been elected Vice President and member of the Board of Directors of **Sleeper & Hartley, Inc.,** 335 Chandler Street, Worcester, Mass.

* * *

William H. Welch, President, in announcing the appointment today, said Mr. Russell will be in charge of sales and will institute a new sales program to bring about closer contact with customers across the nation.

Frank S. Russell

* * *

He attended Worcester schools and is an alumnus of Worcester Academy and Dartmouth College. He joined the engineering department of Sleeper & Hartley in 1951.

Appoints Assistant Chief Engineer

The Coulter & McKenzie Machine Company, Inc., Bridgeport, Connecticut, announces the appointment of **John A. Maltas** as Assistant Chief Engineer, effective March 14, 1960. Mr. Maltas received his B.S. in Mechanical Design from the Rhode Island School of Design in 1951. During the past nine years, he has served as Senior Design Engineer and Chief Engineer of The Gyromat Corporation, Fairfield, Conn. In addition to his engineering duties, Mr. Maltas also coordinated the operations of the Engineering,

SEVEN BAY
HIGH SPEED
STRANDER

MODEL 7 B 55

This precision, perfectly balanced machine features: rigid steel box structure-barrels of high strength ALCOA alloy — motor mounted below center of gravity — safe, positive drive — push button controls— carbide wire guides — interchangeable cradle assemblies — standard cradles taking 7" diam. X 4" Traverse Spools — 30 lengths of lay.

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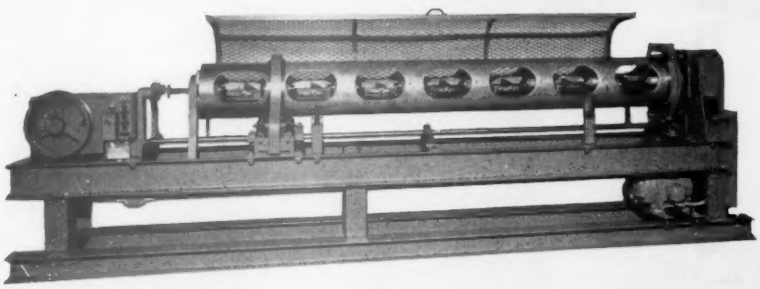

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• TAKE-UP & PAY-OFF STANDS FOR PLATING EQUIPMENT

BARTELL MACHINE-TOOL CORP.
YACHT CLUB ROAD ROME, N. Y.
• DESIGNERS • MANUFACTURERS • ENGINEERS • CONSULTANTS

WE ALSO DESIGN AND BUILD SPECIAL EQUIPMENT TO MEET SPECIFIED REQUIREMENTS

John A. Maltas

Purchasing and Manufacturing Departments at Gyromat. With this addition to its engineering staff, Coulter & McKenzie has increased its capacity the better to serve its customers in research and development.

Acrometal Integrates Sales-Personnel Team

Acrometal Products, Inc., Minneapolis, Minn., has taken another step in its long range program of backing up its products with personnel experienced in the problems of the industry, **Ray Althaus** and **Don Peisert.**

* * *

Both men have been production specialists in wire plants and are personally experienced with the processes and problems of wire production and packaging.

* * *

Ray Althaus, who will take over the Eastern territory formerly covered by **Harrison Lane,** has spent the past ten years (most of it with General Cable) as plant industrial engineer, plant superintendent and specialist in producing and packaging magnet and enamel wire.

* * *

Don Peisert, who takes over the Midwestern territory, comes to Acrometal from **Hudson Wire Co.,** Cassopolis, Mich., where he was wire engineer and later General Manager of the operation. He has a broad acquaintance in the field

Left: Don Peisert
Right: Ray Althaus

where he is known especially for his practical work on machine design as well as problems of production and packaging.

* * *

"We are doing two things currently to implement our long range program of service to the Wire Industry," said **Fred Bieber,** president of Acrometal Products. "The first is to bring creative thinking to the design and manufacture of new equipment to serve special needs. The second is to build up a team of experienced men qualified to work with mill men on a give-

STRANDING?

ALL TYPES OF STRANDING MACHINERY FOR ELECTRIC CABLE & WIRE ROPE INDUSTRIES — RIGID MACHINES, TUBULARS, LOCKED COIL OR HALF-LOCK MACHINES.

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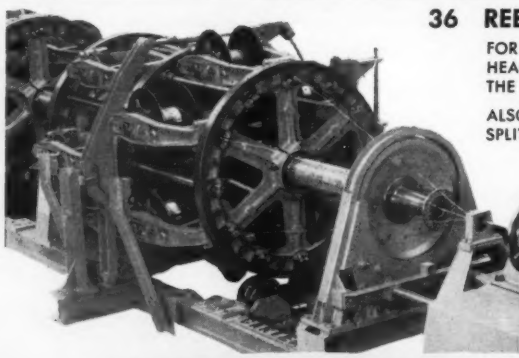

ILLUSTRATION 781.

36 REEL PLANETARY STRANDING MACHINE

FOR 16" OR 405 M.M. REELS. FITTED WITH TWO COMPACTING HEADS FOR ROUND STRAND. FOR COMPACTING TO 90% OF THE ORIGINAL DIAMETER ON COPPER OR ALUMINUM.

ALSO SHOWN IN ILLUSTRATION 781 ARE THE FAMOUS "CARTER" SPLIT CRADLES FOR EASY MAINTENANCE & ASSEMBLY.

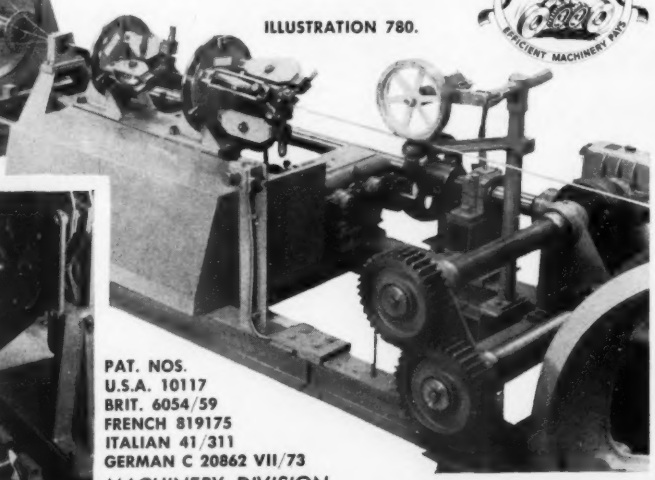

ILLUSTRATION 780.

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and-take basis of mutual understanding. Ray Althaus and Don Peisert's primary assignment will be service—to help mills cut costs, reduce waste, speed up production."

Autolite Appointments

Two new appointments within **The Electric Autolite Company's** Wire and Instrument Division have been announced by Autolite President, **Robert H. Davies. John M. Gerber** has been named General Manager of the division and **Edward A. McNally** will be in charge of the division's plants at Port Huron, Mich. and Hazleton, Pa.

* * *

Mr. Gerber has most recently been manager of the Hazleton plant where Autolite produces all-purpose and specialized wire and cable for aircraft, missile and nuclear applications. Previously he was western regional sales manager for the division. He joined Autolite in 1939 at Port Huron.

* * *

Mr. McNally has headed the Port Huron operations since 1956. Autolite produces automotive wire and cable at the plant and recently consolidated its production of industrial instruments there. He joined Autolite in 1928 and has progressed through posts of increasing responsibilities.

Alpha Metals Promotes Two

The directors of **Alpha Metals, Inc.,** Jersey City, N. J., have announced the election of **Harold A. Cohn** as vice president in charge of their Alpha-Loy Division in Chicago. Joining the firm in 1953, he assisted in setting up the midwest plant he now heads. He has had wide experience in the field of metals marketing.

* * *

Fredrick C. Disque, Jr. was named Director of Research. He was formerly Chairman of the Department of Chemistry, Pratt Institute. Before joining Alpha Metals in 1953, he acted as one of their technical consultants, specializing in research and development of solders, fluxes and high-purity metals for the semiconductor industry.

To Handle Corrosion Research For Carpenter Steel

Dr. Lawrence R. Scharfstein, a former Westinghouse Electric Corp. corrosion engineer, has been appointed supervisor, corrosion research, by **The Carpenter Steel Company,** Reading, Pa.

* * *

In his new position, he heads a corrosion research group for developing new methods to obtain accurate corrosion data for Carpenter alloys. He is also in charge of continuous corrosion tests performed on Carpenter alloys as a part of the company's quality control program.

* * *

Dr. Scharfstein holds a bachelor of science degree in chemical engineering from Penn State University and a doctorate in physical chemistry from New York University.

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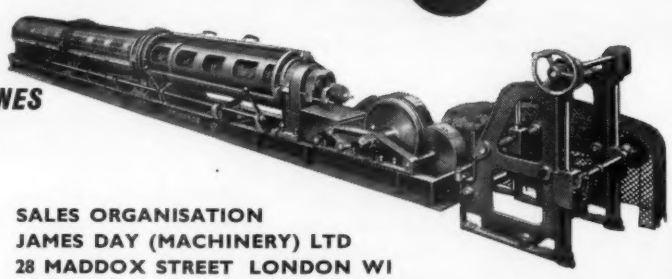

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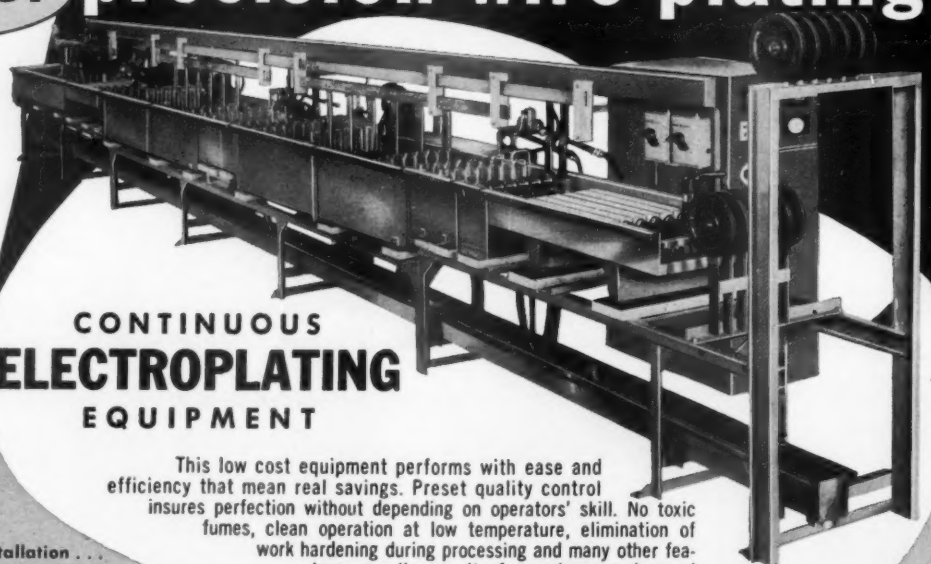

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U. S. PATENT #2823180 AND FOREIGN PATENTS PENDING

Porter Names Four To High Management Posts

C. L. Holbert, President, **H. K. Porter Company, Inc.,** has announced the appointment of **Fred W. Elliott, James A. Drain, Emmett H. Mann,** and **B. Campbell Blake** as Group Vice Presidents, each to have responsibility over a group of the diversified Company's divisions.

* * *

Mr. Elliott, 41, has been Vice President—Production of the Company for the past two years and before that served as Assistant to the President. He will be responsible for Porter divisions manufacturing friction and rubber products, refractories, and paint, as well as the Mexican operations of the company.

* * *

Mr. Drain, 56, joined Porter in August of 1959 from Joy Manufacturing Company where he was a Vice President. He will have group responsibility for the Company's electrical divisions and Canadian operations, including Delta-Star Electric, National Electric and Peerless Electric Divisions as well as H. K. Porter Company (Canada) Ltd.

* * *

Mr. Mann, 35, who has been associated with Porter for six years in various division management capacities, is Group Vice President for the fabricated metal products divisions, which include Disston, Leschen Wire Rope, Forge & Fittings, and Coldform.

* * *

Mr. Blake, 55, for 10 years associated with Porter, will continue to operate the Company's Connors Steel Division as Vice President and General Manager, and will oversee the operations of Vulcan-Kidd Steel Division at Aliquippa, Pa.

Seneca Wire Advances Bormuth

John H. McNerney, Chairman of the Board of **Seneca Wire & Mfg. Co.** Fostoria, Ohio, has announced that **Francis A. Bormuth,** Secretary of the Company, has been elected Vice President.

* * *

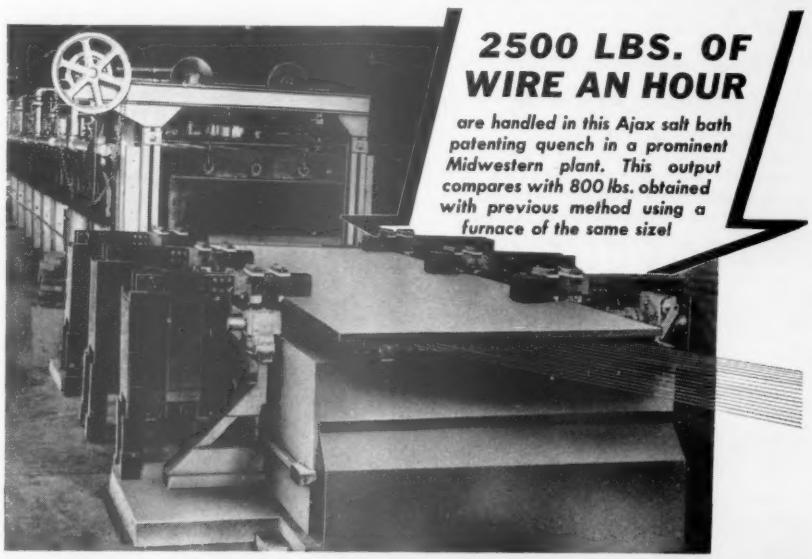
He joined Seneca in 1922 and was employed in various positions in the plant until 1928, when he entered the Accounting Department. Since that time he has served in other capacities, including personnel, credit and as an assistant in general plant management. He served as Controller from 1945 to 1958, was elected Secretary in 1952 and a Director in 1959. In addition to his new duties as Vice President, he will continue as the company's Secretary.

* * *

Seneca Wire first started operations in Fostoria, Ohio, in 1905, manufacturing low and high carbon steel and aluminum wires for many and varied types of products. The company also operates insect wire cloth weaving plants in Hanover, Pa., and Brookhaven, Miss., under the name of Keystone-Seneca Wire Cloth Company.

To Manage Technical Services For Firth Sterling

Firth Sterling Inc. has appointed **Kenneth H. Carlson** manager, technical services. Mr. Carlson will


2500 LBS. OF WIRE AN HOUR
are handled in this Ajax salt bath patenting quench in a prominent Midwestern plant. This output compares with 800 lbs. obtained with previous method using a furnace of the same size!

Here's maximum speed, accuracy and economy in Wire Patenting!

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Internally heated electric and gas-fired types

No other method offers so many possibilities for quality improvement and cost reduction in the patenting of high- and medium-carbon steel wire or rods. Automatic temperature control—an inherent result of Ajax internally-heated salt bath furnace design—provides continuous accuracy within ±5° F. throughout the bath. You are thus assured of the uniformity so vital to obtaining proper tensile strength and grain structure.

More poundage can be handled. Savings up to 30% in pickling time are common. Salt residue is easily removed by a water wash. The entire patenting process lends itself readily to inexpensive automation. Maintenance is negligible. Long-life, immersed-type electrodes can be changed in an hour or two—without tearing down furnace or pot. Pots last indefinitely.

WRITE FOR AJAX CASE HISTORY BULLETINS ON: ☐ Patenting; ☐ Process Annealing; ☐ Descaling; ☐ Cleaning, Preheating, Fluxing.

AJAX ELECTRIC COMPANY 928 Frankford Ave., Philadelphia 23, Pa.

serve as technical and metallurgical adviser to users of Firth Sterling high purity metals—the line of steels and high temperature alloys produced by the Hopkins Process of melting.

* * *

Before joining Firth Sterling, Mr. Carlson was technical manager, specialty steels, for Latrobe Steel Company for five years. Prior to this, he was a service engineer for Latrobe Steel and a metallurgist for Jones & Laughlin Steel Corporation. He is a graduate of the University of Pittsburgh.

* * *

U. S. Rubber Appoints Researchers

Dr. Clide I. Carr and **Dr. Charles P. Roe** have been appointed senior research scientists at the Research Center of United States Rubber Co., Wayne, N. J., according to an announcement by **Dr. L. M. White,** director of research and development.

Dr. Carr, in the radiation research and fiber departments, is engaged in research on the preparation and evaluation of new fibers. **Dr. Roe,** a member of the Research Center's latex and plastics department, is conducting studies in the production of synthetic polymer dispersions.

To Handle Research on Alloys

Dr. Robert H. Pry has been named manager of the Alloy Studies Section at the **General Electric Research Laboratory,** it was announced this week by **Dr. Walter R. Hibbard, Jr.,** manager of the Metallurgy and Ceramics Research Department.

* * *

Dr. Pry received his bachelor's degree from the Texas College of Arts and Industries, and his M.A. and Ph.D. degrees from Rice Institute. He was a recipient of Dow Chemical Company and Shell Oil Company fellowships. He joined the staff of the GE Research Laboratory as a physicist in 1951 and has specialized in studies of mechanical behavior of metals and alloys, the electronic properties of oxides, and the development of magnetic alloys.

Hunter Spring Appoints Design Engineer

Appointment of **Raymond J. Neely** as Design Engineer is announced by the **Hunter Spring Company,** a Division of American Machine & Metals, Inc., Lansdale, Pa. Added to meet the demands of Hunter's rapidly expanding line of force measuring and testing equipment, Mr. Neely will be primarily concerned with the design and development of special inspection, testing and manufacturing equipment.

* * *

He was formerly with the **Tinius Olsen Testing Machine Company,** where he was employed for eight years as a design engineer on testing equipment. During his twelve years of engineering work, he has taken numerous extension courses at both Penn State and La Salle College.

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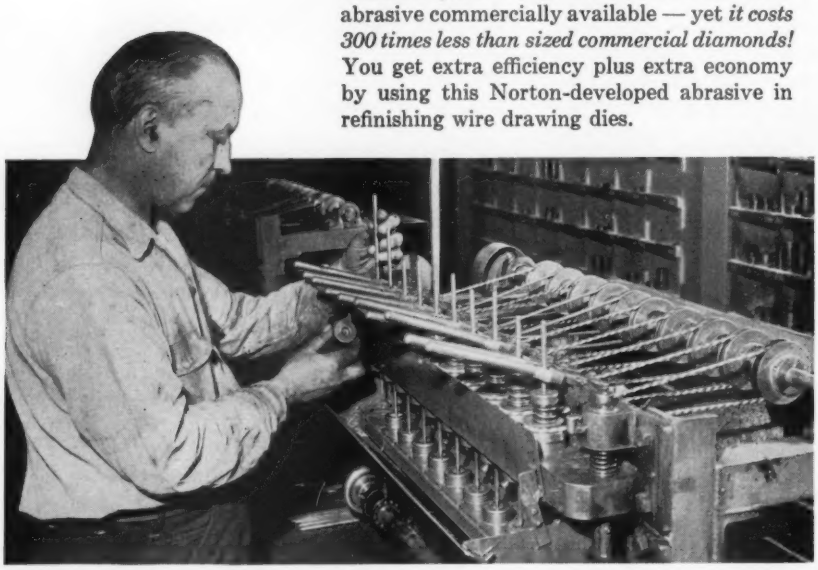

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A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,927,299, HEATER TUBE MOUNTING, patented March 1, 1960 by Frederick L. Lefebvre, Twinsburg, Ohio.

This mounting for electronic heater tubes is constructed of a single length of wire, bent to shape, to provide a resilient support.

No. 2,927,741, WIRE COILING DEVICE, patented March 8, 1960 by John A. Moore, Sayre, and Richard W. Lees, Athens, Pa., assignors to Ingersoll-Rand Company, New York, N. Y., a corporation of New Jersey.

More specifically, this is a power-driven bit wire coiling gun.

No. 2,927,954, SHIELDED OIL WELL CABLE, patented March 8, 1960 by Frank H. Ellsworth, Worcester, Mass., assignor to United States Steel Corporation, a corporation of New Jersey.

Twisted together wire conductors with insulating and shielding materials surrounding them, and a layer of armor wires surrounding the latter is disclosed.

No. 2,928,152, CLOTHESPIN, patented March 15, 1960 by Harold L. Henneberry, Jr., West Hartford, Conn.

The pin is of a single length of resilient wire coiled into a large loop, and two smaller loops at the free ends of crossed straight terminal portions extending from the large loop.

No. 2,928,458, SPRING ASSEMBLY FOR SPRING CUSHIONS, patented March 15, 1960 by John G. Platt, Carthage, Mo., assignor to Flex-O-Lators, Inc., Carthage, Mo., a corporation of Missouri.

A feature of the cushion is a set of main spring units, each formed of a length of resilient strip material having a generally straight central portion disposed above and generally parallel to the cushion frame and end portions connected to the frame, the central portion forming the load-supporting platform of the assembly in conjunction with the like portions of the other spring units.

No. 2,928,528, WIRE-DRAWING DIE, patented March 15, 1960 by Roy M. Kelday and Frederick L. Hayden, Hamilton, Ontario, Canada, assignors to The Steel Company of Canada, Limited, Hamilton Ontario, Canada.

The passage through the die having a general cross-sectional shape which is non-circular over at least a substantial portion of its working length and being helically twisted about its longitudinal axis throughout this portion of non-circular cross-sectional shape, whereby a wire drawn by the die is characterized by crests and valleys wherein grain flow lines run longitudinally across the valleys in the direction of the longitudinal axis of the wire.

No. 2,928,617, COIL WINDING APPARATUS, patented March 15, 1960 by John F. Lill, Fort Wayne, Ind., assignor to Fort Wayne Tool Die & Engineering Company, Fort Wayne, Ind., a corporation of Indiana.

The apparatus is adapted for stators and the like of the type in which an elevatable winding nest is adapted to receive a stator, a driving means moves a winding head to form successive wire turns at high speed on the stator during a winding cycle and an auxiliary driving device moves the winding head to a predetermined position at the termination of a winding cycle.

No. 2,929,066, NAIL DISTRIBUTORS, patented March 22, 1960 by Stephen A. Makovski and Robert Charles Quarmby, Leicester, England, assignors to United Shoe Machinery Corporation, Flemington, N. J., and Boston, Mass., a corporation of New Jersey.

A vibratory carrier, having railways, is provided, with stops which are mounted for movement between projected positions in which they prevent movement

Our manufacturing program comprises wire drawing machines, bolt and nut making machines, multi-stage cold headers for series parts, etc

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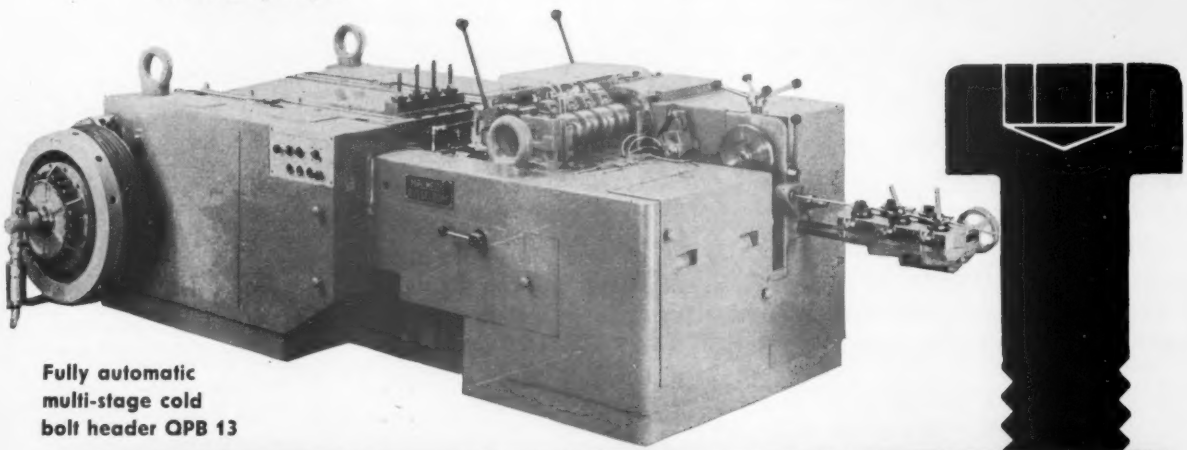

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of nails down the nailways and retracted positions in which they allow the nails to move down in the nailways to a nail-receiving roll.

No. 2,929,083, WIRE STRIPPER, patented March 22, 1960 by Willard J. Davis, Mount Marion, N. Y., assignor to International Business Machines Corporation, New York, N. Y., a corporation of New York.

Electric switch actuated stripping rollers are provided having cleaning means which is oscillated as the wire is payed out longitudinally along the stripping surfaces of the rollers.

No. 2,929,132, METHOD OF FABRICATING COILS, patented March 22, 1960 by Marion Wohlhieter, Livingston, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

The method of fabricating strain relieving terminal connections to fragile windings of bobbin wound electrical components is disclosed.

No. 2,929,136, WIRE LENGTH MEASURING, MARKING AND SEVERING EQUIPMENT, patented March 22, 1960 by Karl H. Andren, West Allis, Wis., assignor to Artos Engineering Company, Milwaukee, Wis., a corporation of Wisconsin.

There are nine claims to this patent for rapidly measuring, marking and severing the wire.

No. 2,929,282, EQUIPMENT FOR PRODUCING GROOVED RODS OR THE LIKE, patented March 22, 1960 by Valentin Retterath, Iversheim, Germany, assignor to Groov-Pin Corporation, a corporation of New York.

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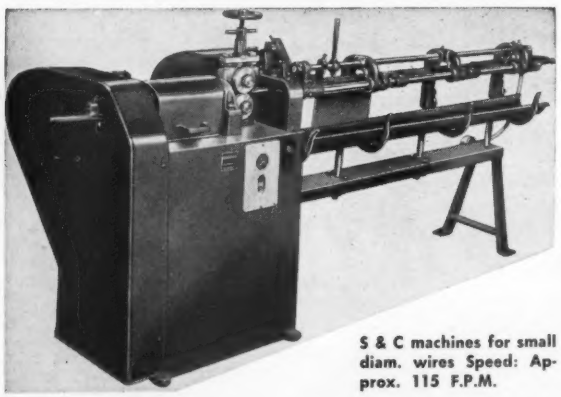

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Built in several sizes to handle 2 to 18 ga. basic and high carbon wire.

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The guide bar of these new machines can be supplied for any cut lengths • The rotary flier runs on ball bearings for smoothness and long life • Cut-off is actuated by a solenoid for extreme accuracy of cut lengths • A two point cam construction provides a quick and positive return of the cut-off knife, eliminating the need for a clutch and dog • A counter is standard equipment.

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A tubular holding member having a slot is provided for holding the wire or rod as a peripheral portion of a rotating grooving wheel enters the slot to groove the wire or rod. Eight claims.

No. 2,929,284, MULTIPLE WIRE CUTTER AND STRIPPER, patented March 22, 1960 by Helge W. Hagstrand, Milwaukee, Wis., assignor to Artos Engineering Company, Milwaukee, Wis., a corporation of Wisconsin.

The wires travel in parallel spaced relation to wire-severing knives, being guided by special wire guiding devices.

No. 2,929,285, METHOD AND MACHINE FOR STRIPPING METAL BRAID FROM THE END OF SHIELDED WIRE OR CABLE, patended March 22, 1960 by Thomas A. Gulemi, Springfield Gardens, N. Y., assignor to Sperry Rand Corporation, a corporation of Delaware.

A method of stripping metal braid from the end of shielded wire is disclosed and comprises threading the end of the wire through a knife with a circular cutting edge making a close fit with the braid, changing the longitudinal relation between the braid and wire to bunch the braid on the threaded side of the knife, and unthreading the wire from the knife to cut the braid at the bunch and strip the cut braid from the end of the wire.

No. 2,929,283, WIRE CUTTING APPARATUS COMPRISING A ROTARY WIRE CARRIER MOVABLE PAST A FIXED CUTTER, patended March 22, 1960 by Walter J. Gorecki, Chicago, Ill.

More specifically the apparatus is for cutting the lead wires of resistors and capacitors and the like to desired length. There are eight claims.

No. 2,929,509, BELT HANGER, patented March 22, 1960 by Laurence W. Van Dusen, Escondido, Calif., assignor to Mission Industries, National City, Calif. ,a corporation of California.

This hanger is composed of several lengths of wire bent to shape.

No. 2,929,569, CONTINUOUS WIRE WINDING APPARATUS, patented March 22, 1960 by Judson N. Detrick, Oak Park, Carl R. Hoffman, Riverside, and Lester W. Malzahn, Maywood, Ill., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

A pair of rotating takeup devices is provided, with the wire distributed upon one of them with a device for distributing strand material onto a first of the takeup devices, means for transferring the distributing device to distribute strand material onto the other of the takeup devices, and means operated by the transferring means during movement of distributing means to distribute strand material onto the other of the takeup devices for accelerating said other takeup device.

No. 2,929,574, APPARATUS FOR DISTRIBUTING FILAMENTARY MATERIAL INTO COIL FORM, patented March 22, 1960 by George E. Henning, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Ten claims cover apparatus comprising a base, a ring gear secured to the base, a capstan wheel mounted rotatably on the base for advancing the material,

a planetary gear secured to the capstan wheel and designed to mesh with the ring gear, and a device for driving the planetary gear around the ring gear, whereby the material advanced by the capstan wheel is simultaneously distributed along a circular path.

No. 2,929,575, FLYER TYPE WIRE COILING MACHINE, patented March 22, 1960 by Joseph J. Kovaleski, Trumbull, Conn., assignor to The Coulter & McKenzie Machine Company, Bridgeport, Conn., a corporation of Connecticut.

A flyer assembly for receiving the wire is provided for receiving wire from a source of supply and laying the same in coils in a wire receiving means; said flyer assembly comprising a support member rotatably mounted on the frame, a coil forming capstan rotatably mounted on a support member for rotation therewith in an orbit around an axis of rotation of the support member, means for guiding wire to the capstan, means for casting the wire, means for rotating the capstan on its axis so that the wire is drawn through the guide means and casting means and means for rotating the support member so that wire emanating from the capstan is laid in coils in the wire receiving means. There are fifteen claims.

No. 2,929,576, APPARATUS FOR DISTRIBUTING A STRAND INTO COIL FORM, patented March 22, 1960 by George E. Henning, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

More specifically, the invention resides in a device for revolving the sheaves as a unit around the axis of a capstan at alternately increasing and decreasing speeds so that the the strand is distributed along a descending helical path having an alternately increasing and decreasing radius for collection in a continuous succession of coils having varying radii.

No. 2,929,577, APPARATUS FOR COILING STRANDS, patented March 22, 1960 by George E. Henning, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

There is provided means for rotating a coiled strand container about the axis of a coil to be formed alternately with and against the direction of distribution of the strand thereto in order to collect the strand in a continuous succession of coils having varying radii.

No. 2,930,268, WIRE FEEDING AND CUTTING MACHINE WITH FEED EFFECTIVELY STOPPED BY ROLLING BACK ON WIRE, patented March 29, 1960 by Herman P. Neptune, Los Angeles, Calif.

The wire feeding means is provided with a resilient take-up device whereby when the wire closes the switch, movement of the wire is stopped and the means for feeding the wire rotates upon and travels in a direction opposite to the direction of wire feed upon the wire, to compress the resilient take-up device.

No. 2,930,313, BINDING OF WIRE COILS, patented March 29, 1960 by Hermann Bocher, Koln-Kalk, Germany.

There are thirteen claims in this patent for apparatus for binding a coil of wire suspended from a hook on a conveyor.

No. 2,930,412, WIRE FORMING MACHINES, patented March 29, 1960 by Joseph H. Hoern, Saginaw, Mich., assignor to Saginaw Wire Products, Inc., Saginaw, Mich.

More particularly, this patent and its fifteen claims covers a wire bending machine.

No. 2, 930,413, COIL ASSEMBLING MACHINE, patented March 29, 1960 by John W. Kozak, Kenosha, Wis., assignor to Frank L. Wells Company, Kenosha, Wis., a corporation of Wisconsin.

Offset coil springs may be formed and assembled by this machine which includes mating recesses to receive the offset coil portions of the springs and to hold them for weaving a spiral about the latter to hold them in assembled relation.

No. 2,930,539, COILING MACHINE, patented March 29, 1960 by Dick Bremer, Bloomfield, N. J., assignor to United States Rubber Company, New York, N. Y., a corporation of New Jersey.

A machine is provided for coiling an elongated flexible member in both a conical spiral and a flat spiral.

No. 2,930,541, UNCOILER DEVICE, patented March 29, 1960 by Eben Jefferson Crum, Baltimore, Md.

Sjogren SPOOLER

This machine is especially designed for wire mill use and incorporates many outstanding features adapted to present day high speed production.

SPEED — When placed directly behind wire drawing machine the Sjogren Spooler is capable of spooling at 1800 fpm.

CAPACITY — 100 pound maximum.

TRAVERSE — Hydraulic traverse is infinitely adjustable from zero to 5/8" per rpm of spool.

LOADING — Loading of spool is air-actuated.

TENSION — Louis-Allis eddy current clutch type motor with potentiometer for variable tension.

STARTING — Forced acceleration circuit prevents slack wire during wire drawing machine acceleration.

BRAKING — Goodyear airplane disc type brakes.

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Apparatus for uncoiling a free coil of wire is disclosed.

No. 2,930,584, METHOD AND APPARATUS FOR INSERTING WIRES IN CONDUITS, patented March 29, 1960 by Owen L. Hensley and James C. Hamrick, Charlotte, N. C., assignors to Jet Products, Inc., a corporation of North Carolina.

Eleven claims are in this patent which comprises the steps of attaching the line to a self-propelled projectile, positioning the projectile for passing through the conduit, activating the projectile to propel the projectile through the conduit while trailing the line attached thereto therebehind, and guiding the projectile through the conduit by the internal wall surface of the conduit to lay the line in the conduit.

No. 2,930,718, METHOD AND APPARATUS FOR COATING AN INSULATED CONDUCTOR, patented March 29, 1960 by Charles W. Abbott, Clearwater Beach, Fla., assignor to The Whitney Blake Company, New Haven, Conn., a corporation of Connecticut.

In the process of coating a previously-insulated conductor which is at room temperature the inventor introduces the preliminary step of heating the surface of the conductor insulation to a temperature which is high enough to evaporate the solvent from a layer of coating material applied on the heated surface of the insulated conductor, the length of time the insulated conductor is subjected to heat and the heat employed being such as to heat only the surface of the insulated conductor without substantially heating the conductor core.

No. 2,929,069, TOOLS FOR SECURING WIRES TOGETHER BY MEANS OF DEFORMABLE CLIPS, patented March 22, 1960 by Georges Etienne Christin, Boulogne-sur-Seine, France, assignor to Etablissements Bertrand Faure, Puteaux, France, a society of France.

A tool for wrapping around substantially parallel wires to be secured together a clip made of a thin deformable plate initially bent in substantially U shape is disclosed.

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Signal Corps' 9th Annual Symposium

The dates of Nov. 30 and Dec. 1 and 2 have been announced for the 9th Annual Symposium on "Technical Progress in Communication Wires and Cables". The three-day meeting will be held, as usual, at the Berkeley-Carteret Hotel, Asbury Park. It will be under the sponsorship of the U. S. Army Signal Research and Development Laboratory.

* * *

Howard F. X. Kingsley of the Fort Monmouth Laboratory, is general chairman. He will be assisted by C. T. Wyman, Bell Telephone Laboratories; **Ray Blain,** U. S. Army Signal Engineering Agency; **Richard P. Houlihan,** Gavitt Wire and Cable Co; **Spencer Montgomery, Jr.** The Montgomery Co; **Ira T. Stoneback,** International Telephone and Telegraph Laboratories; **H. L. Wuerth,** B. F. Goodrich Chemical Co., and **Fred W. Wills,** Signal Research and Development Laboratory.

* * *

The attendance at the symposiums has grown from 433 the first year to well over 1,000. In attendance are leaders in the wire and cable and allied fields from this country and abroad.

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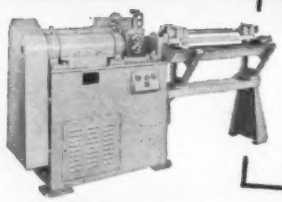
infinite, variable speed, electrically controlled,

Automatic Wire Straightening and Cutting Machine!



CAPACITY: 1/16" to 3/16" mild steel wire, 1/16" to 5/16" high tensile wire, 50 to 200 FPM.

Send for complete details on this high speed, low cost dependable SHUSTER! Ask for our quotes on your wire straightening and cutting needs for any wire sizes from .020" to 1 1/16".

SHUSTERS give you straightened and cut wire *when* you need it, at lower investment than any comparable machines. The right combination to lowered production costs is *coiled* wire plus a dependable SHUSTER. Let one of our sixty representatives (there's one near you) give you the facts. Let us show you how you can materially lower your wire production costs!

Send for free, handy, wall-size split gauge wire chart from 41 gauge to 7/0.

METTLER MACHINE TOOL, Inc.

LOWEST COST THREAD ROLLER

SHUSTER, the oldest name in wire straightening and cutting, introduces a *new* Thread Roller at far less initial investment. Brings thread rolling well within range of the small to medium producer.

check these specs:

- reciprocating die type
- manual or hopper feed
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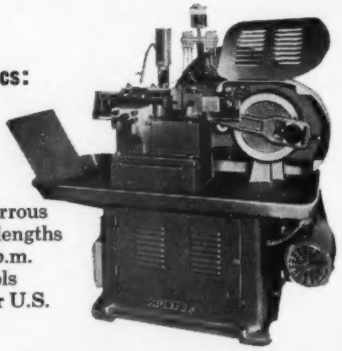
- 2" or 3" max. lengths
- 60 to 120 pcs p.m.
- electric controls
- 3 HP motor or U.S. Varidrive
- 4 Models



Let us quote you! Prompt delivery.

METTLER MACHINE TOOL, INC.

Adeline Street, New Haven, Connecticut

Magnet Wire Standards

National Electrical Manufacturers Association, 144 East 44th St., New York 17, N. Y., has announced the availability of new or revised standards on magnet wire as follows:

MW 2 — 1959 Polyethylene Coated
MW15 — 1959 Vinyl-Acetal Coated
MW 17 — 1959 Vinyl-Acetal Coated
MW 19 — 1959 Vinyl-Acetal Self-Bonding

* * *

Copies of the above cost 30 cents each, and may be secured from NEMA.

Poster on Reel Handling

The number one cause of damage to cable reels is improper handling with fork-lift trucks. This was revealed in a survey conducted by the Wire and Cable Division of the **National Electrical Manufacturers Association.**

* * *

Although the industry has kept its damages remarkably low, continuing efforts should be made to eliminate improper handling practices through reminders to employees, carriers, and others.

* * *

To promote proper handling, a colorful, cartoon-style poster, showing how and how not to handle wire and cable reels with a fork-lift truck, has been prepared.

* * *

The poster — red and black on heavy stock white paper — is available in two sizes, 8½ x 11 and 13 x 17 inches. The smaller poster is 15 cents per copy, and the larger poster is 25 cents per copy. Bulk rates available for quantity orders (FOB New York). Order from Wire and Cable Division, NEMA, 155 E. 44th St., New York 17, N. Y.

ASTM Standards on Metallic Coated Iron and Steel Products

This 2nd edition is virtually a complete revision of the first edition issued in 1956. Of the 34 standards, all but 5 have been newly added, revised, or have had their status changed.

Among the materials covered are zinc coated wire, strands, fencing, sheets, pipe and hardwire. Also included are aluminum coated wire and aluminum coated iron and steel articles as well as terne-alloy-coated sheets. There are 25 specifications, 6 methods of test, and 3 recommended practices.

* * *

Engineers concerned with coated metallic products, corrosion and maintenance will find this compilation useful in their work.

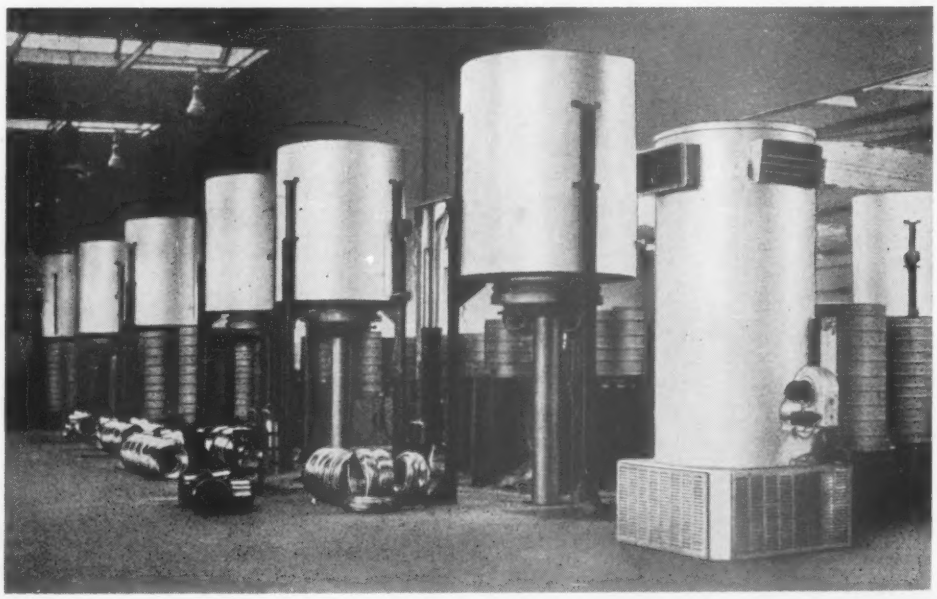
* * *

Copies of this book may be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa. at $3.50 each.

Self-Cleaning Wedge-Wire Screen

A new wedge-wire screen known as "Rima" and made of wire with thinner profiles than previously available is being introduced by Cross Perforated Metals, **National-Standard Company,** for screening, sifting, dewaterizing, sizing, wash-

THE LAST WORD IN MODERN EFFICIENT DESIGN!



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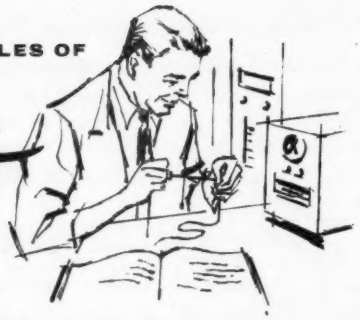

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ing and filtering minerals, chemical products, paper-making materials and food products. The high, narrow profiles of the wedge wire permit more wires per area of working screen surface than other shaped-wire screens, increasing percentage open area and increasing screening capacity.

* * *

Rima screens are made of stainless and carbon steels. They are furnished in rectangular, oblique angled, round and oval beds with sharp or round bends. Conical segments, cylindrical troughs and many other special shapes are available.

* * *

Screen wires, made of stainless and carbon steels, are available in several profiles, including slanting tapered, tapered, flanged, and diamond. The profiles eliminate blinding and clogging because any particle that passes the top will quickly clear the entire opening. Slit widths down to 0.002 inches can be furnished. Spacing lugs provide rigidity in the screen, prevent lateral deflection, and preserve uniform slit spacing.

* * *

The new screen was developed in Germany by Hein Lehman & Co., and is sold in the United States under exclusive license by National Standard Company.

Forms German Partnership To Make Tire Wire

National-Standard Company, a major producer of specialty wire and metal products, has entered into partnership with the **Arbed** and the **Felton & Guilleaume** organizations of Western Germany to manufacture tire bead wire and tire carcass wire, according to **Thomas H. Pearce,** National-Standard president. The new company is located in Cologne, West Germany and will be called F&G —Arbed-National Standard GmbH.

* * *

Arbed is a leading producer of steel and Felton & Guilleaume is a major manufacturer of copper and steel wire.

New Multiple Spindle Die Ripper

Two new types of Automatic Spindle Rippers for rough finishing tungsten carbide dies are now manufactured by **Dykrex Corporation of America.**

* * *

These are Light and Heavy-Duty types that are available in single, double and triple units. One operator can easily run up to six spindles in less time and for a fraction of the cost of the old style single ripper. It is operated pneumatically, has time switches, and a new style head that can be adjusted for various sized dies and the required pressures for adjustable cutting and ripping. Boron or Silicon Carbide is the cutting material and a special easy-cleaning, abrasive pumping unit is attached to each spindle ripper.

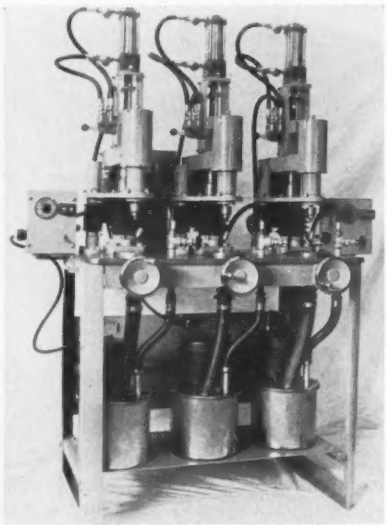


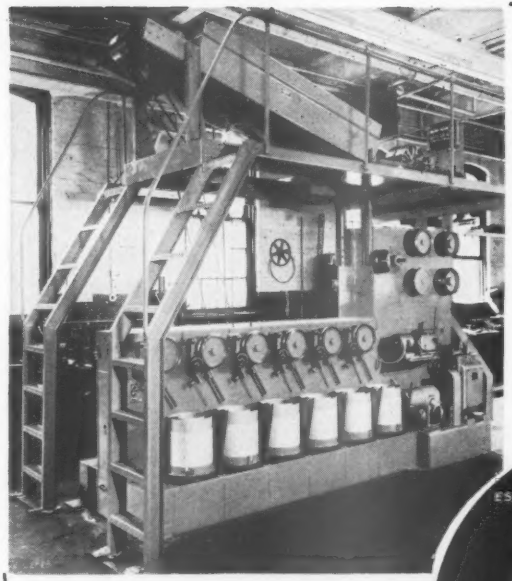
Photo of Triple Unit

* * *

For prices and detailed information write to Dykrex Corporation of America, P.O. Box 9022, North Station, Newark 4, N. J.

Promoted by Armco

Russell M. Nein has been appointed superintendent of the cold strip mill at **Armco Steel Corporation's** Middletown Works. He succeeds **Perry A Hoss,** who is retiring after 46 years of service with Armco. The announcement was made today by **D. S. Holstein,** manager of the Middletown plant.



Left: Barrel Take-up No. 1237, B&S Gauge 20 to 30, for enameling machine with preannealer.

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TAKE-UPS & PAY-OFFS
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MANUFACTURERS OF WIRE INSULATING MACHINERY AND ALLIED EQUIPMENT. MACHINERY MFG. TO CUSTOMERS SPECIFICATIONS.

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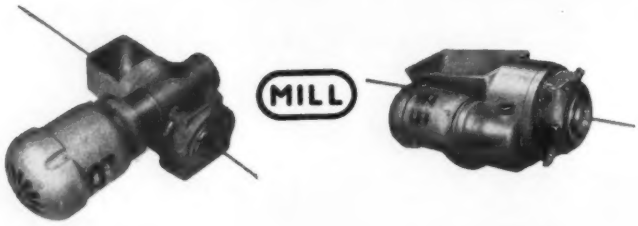

Type FR43
for max. outside dia. of die 1 11/16"

Type FR53
for max. outside dia. of die 3 5/32"

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Japan: Asia Industry, Saiwai Bdg, Uchisaiwacho, Chiyodaku, Tokyo.
Spain: Semill, apartado 419, San Sebastian.
Sweden: S. Bergstrom & Co., Post Box 47039, Gateborg, 47.
U. S. A.: Standard Industrial Compounds Co., Frankfort, Illinois.

other countries representatives are needed

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Capstans
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Twinners, Stranders, Cablers, Bunchers
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Taping Equipment
Fine Wire Takeup and Respooling Equipment
Wire Drawing Machines
Specially Built Equipment
And Much More

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Wire Drawing Dies
Wire Drawing Spools
All Types of Reels and Spools
Lithographed Spools
Inks for Printing Machines
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Numerous Other Items

all the wire industry in the West looks to 2 companies

First, there's Western Wire & Textile Machinery, Inc., the only company in the West that deals exclusively in used and reconditioned wire and cable-making equipment.

Secondly, there's the Paul I. Kenner Co., supplier and distributor of new wire and cable manufacturing machinery and supplies.

Nowhere else in the West will you have a better chance of finding exactly what you need---either new or used. Nowhere else in the West will you be able to trade in old equipment on new. Nowhere in the West will you find such a complete stock of machinery and equipment.

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PAUL I. KENNER CO.
228 Shaw Road South San Francisco, Calif. Tel.: JUno 9-1101

Modern Continuous Belt Furnaces Harden Many Different Parts At High Production Rates

(*Continued from page* 620)

Several unusual features are incorporated in the heat treating installation. The heat treating department is located on the fifth floor of a seven story building. Although slightly unconventional, this is the most logical location because of the flow of work is from the ground floor to upper floors. Heading and other primary operations are on the ground floor. Secondary and finishing operations are located on floors above ground level.

* * *

The physical arrangement of the quenching facility is also unusual. The storage tank for quench oil is located under ground level, six stories below the quench tank. Oil is pumped to the tank by means of a closed system. The quench oil is then circulated in the system through filters and coolers. Temperature of the oil is held constant at 150°C. Additional agitation is supplied in the tank by propellers.

* * *

When it is necessary to switch from an oil quench to a water quench, the oil is drained to the underground storage tanks. The quench tank is then filled with water from regular plant water lines. During quenching, fresh water is piped through the cooling system. A certain quantity of water is allowed to overflow and is continually replaced by fresh water from the line. When switching from water to oil, the water in the tank is drained into the sewer. In the process of draining the tank there remains still a slight amount of water. This is removed by adding an emusifying solution, then draining it into the oil storage tank. After this emulsion reaches the oil storage tank, the water separates and settles to the bottom of the tank. When the water content of the oil tank reaches a limit level, it is pumped into the plant's regular waste system.

* * *

Two Surface RX gas generators, each having 3600 cfh capacity, supply atmosphere for the continu-

ous belt hardening furnaces. Usually one of the generators supplies enough atmosphere for the two continuous furnaces, and the other is used as a standby unit.

* * *

Work which is water quenched is always processed in a protective atmosphere. Because of this, water quenching is more complicated than oil quenching. With a water quench, parts falling into the quench create a certain amount of water vapor which has a tendency to rise into the furnace and consequently raise the dew point of the atmosphere to a point where the atmosphere would be useless. To prevent this, eductor tubes are placed in the quench chute, between the water level and the hearth level, so water vapor, and some atmosphere, is educted from the chute. This guarantees the dew point to remain at the level set for the work being processed. For carbon restoration or for high carbon material, natural gas is added to provide the proper carbon potential for the furnace atmosphere.

* * *

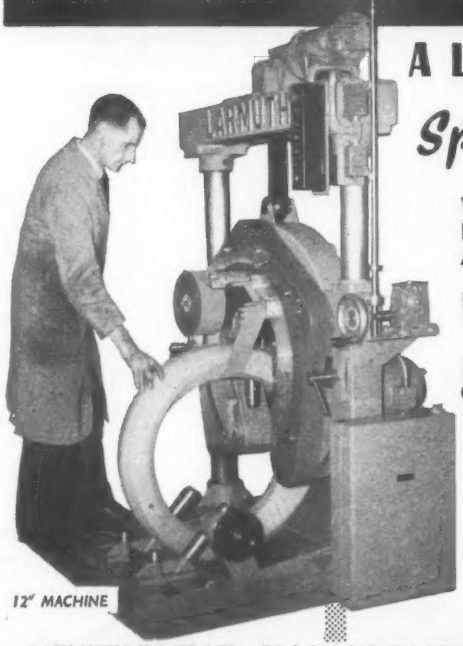
Since replacing the older, smaller units with the two continuous belt furnaces, we have derived a number of advantages. The use of two furnaces has lessened the amount of manual monitoring formerly required for the many smaller furnaces used to produce the extremely varied work. Better atmosphere control is now possible. This means, better quality of product, with a minimum of rejects, which, of course, results in better customer relations. The use of the larger furnaces has cut maintenance costs because fewer moving parts are involved, and less alloy is used in furnace construction. An efficiency factor has made it possible to reduce operational man power and increase production.

* * *

Because the furnaces can be changed quickly from one quenching medium to another, down time is virtually eliminated. The use of two furnaces gives the necessary flexibility so vital to the production of 40,000 different items that are made from practically every grade of standard steel.

HEAVY COIL WRAPPING MADE EASY WITH LARMUTH'S NEW 12" MACHINE

Now Glues The Paper As It Wraps



12" MACHINE

A LARMUTH *Spiral Wrapping* MACHINE

WITH PATENT MECHANICAL LOADING AND EJECTION

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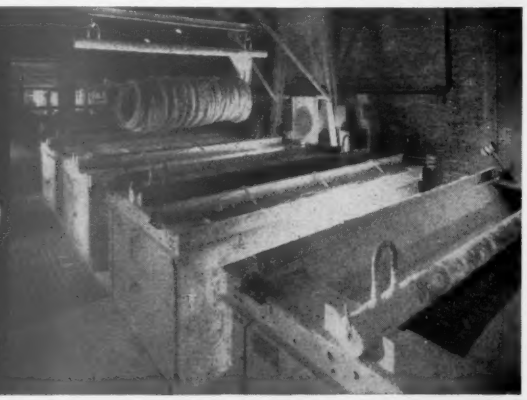

Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

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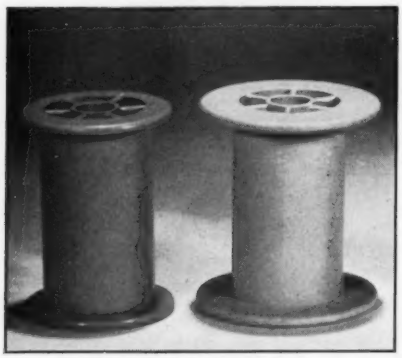

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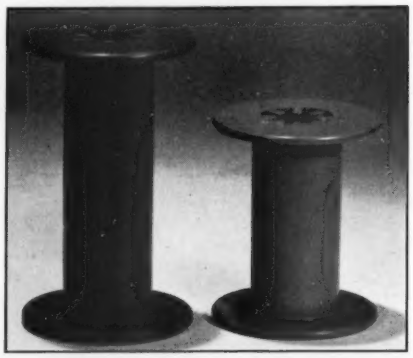

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WIRE COIL RACKS

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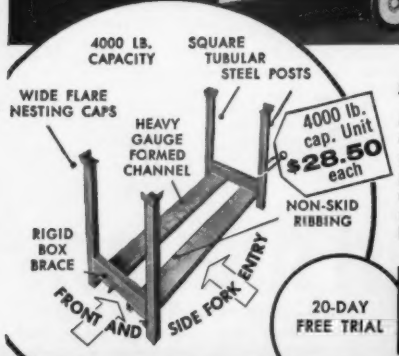

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MODULAR STORAGE SYSTEMS FOR METAL INDUSTRY • STEELMOBILE

New Insulation Applications of High Density Polyethylene And Polypropylene

(*Continued from page* 618)

periority of the polyolefin polymers in this respect.

* * *

The very high stiffness of Pro-fax tends to limit its use to thin-walled insulations. In such applications it exhibits outstanding cut-through resistance and resistance to deformation under load at elevated temperatures, superior to even high-density polyethylene. Its complete lack of thermal or environmental stress crack has helped to intensify interest in this new polymer. Potentially, it seems well suited to small-gauge wire insulations such as telephone primary insulation, where excellent physical properties are required.

* * *

It would be unfair to dwell too long on the advantages of polypropylene before commenting on some of the shortcomings. This new polymer does not have the remarkably good low temperature flexibility exhibited by polyethylene. The low-temperature flexibility of Pro-fax insulated wire is somewhat dependent on the conditions of extrusion, but experience so far has indicated that the brittle point is about —20°C. It has also been shown that the brittle point is apparently influenced by conductor size. The smaller the conductor, the lower the brittle point.

* * *

We have found that the presence of copper has a very deleterious effect on the aging properties of Pro-fax insulation at elevated temperatures. At 133°C., Pro-fax 6512 insulation on aluminum wire will finally embrittle at about 750 hours. This compares very favorably with 25 mil strips of Pro-fax 6512, which will require 750->1000 hours to embrittle at 133°C. However, the same insulation on **copper** wire embrittles within 168 hours at 133°C. It has been found that the addition of 0.5% of Agerite White to 6512 Pro-fax has doubled the time to embrittlement in the presence of copper. Unfortunately, tinning the copper conductor does not help a great deal, presumably because tinning only

partially protects the insulation from copper.

* * *

The problem of copper poisoning exists only in applications where prolonged exposure to elevated temperatures is required. It is of little importance if the insulation is expected to operate at temperatures below 70°C. (telephone wire insulation for example). Pro-fax 6512, even when coated on copper wire, exhibits good aging properties. For instance, at 110°C. in an air oven, Pro-fax 6512-coated copper wire will remain flexible for about 2000 hours. At 90°C. in water, no cracking or embrittlement has occured in 10,000 hours.

* * *

The copper-poisoning problem must be solved before polypropylene will find many applications utilizing its excellent high temperature mechanical properties. The fact that this problem is as yet unsolved can be attributed to the short time polypropylene has been available. Several laboratories are working on the copper effect and there seems to be no doubt that it will be solved in time.

* * *

Pro-fax polypropylene lends itself very well to foamed insulations. Its high flexural modulus and excellent resiliency contribute good crush resistance. The good high temperature mechanical properties make it ideal for high-temperature-resistant coaxial cables. Apparently because of some orientation which occurs during the extrusion of the foamed insulation, foamed Pro-fax exhibits better low temperature flexibility than does solid Pro-fax. The foam-extrusion operation appears straightforward and commonly used foaming agents have been found satisfactory.

* * *

Our recommendations for the extrusion coating of wire with Profax polypropylene are very similar to our recommendations for Hi-fax high-density polyethylene: long-barreled extruders with about 20:1 ratio of length to diameter are preferred, although a 16:1 ratio can be used. The screw design is not too critical, but a shallow flighted metering type has given

Niederrhein, Europe's largest wire rod facility with its completely modern installations assures close tolerances for diameter and out-of-round, excellent surface and light scale.

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inside diameters 20, 24, 26, 33 1/2"
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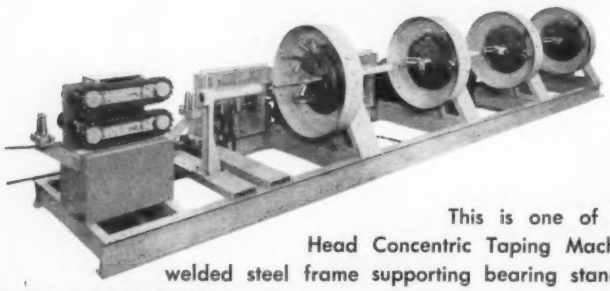
FOUR-STATION CONCENTRIC TAPING MACHINE for ELECTRIC CABLES



This is one of EDMANDS' Multiple Head Concentric Taping Machines. Has one-piece welded steel frame supporting bearing stands for taping heads and supports for the capstan.

Driven by v-belt from Louis Allis Adjusto-Speed Drive for slow starts and speed variation. Capstan is tractor type, using change gears to control rate of lay.

Taping heads mounted in ball-bearing pillow blocks. Any head can be clutched out at will. Tape pads also mounted on ball-bearings. Heads fitted with electrical stop motions that operate at end of package or if tape breaks.

Heads accommodate pads of 12, 16, 18, 19, 22 or 24 in. dia. and 3/8" to 4" in width. Supplied with as many heads as needed.

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the best results. We have observed no advantage in cooling this type of screw. Long land dies are important, especially if a short-barreled extruder is being used. For thin coatings on fine gauge wire, the land length should be approximately 40:1 length: thickness of coating, or approximately 10:1 length: orifice diameter (or an average of the two values calculated). Stock temperatures in the range of 450-600°F. have been used. There is some indication that the best low temperature properties result from using the lower end of this range of stock temperatures. Wire preheat of at least 350°F. is essential if good elongation (>300%) is desired. Gradient cooling is suggested to eliminate vacuum bubble formation along the conductor-insulation surface.

* * *

Polypropylene is one of the newest thermoplastic materials which seem to offer great promise to the wire and cable industry. Because it has been available for such a short time there are still many unanswered questions regarding its use in this field. However, the outstanding properties of polypropylene, its high melting point, crush resistance, and complete lack of stress cracking, seem to assure its place in the future of the wire and cable industry.

New Tension and Torque Control Brochure

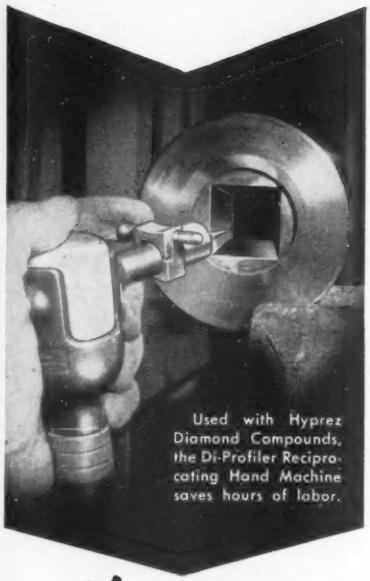
Web Controls Corporation, West Englewood, N. J., has just released a new six page brochure on tension and torque control units for webs and filaments, automatic edgeguide installations, and electric or pneumatic eye controls.

* * *

The brochure gives all the specifications, charts, graphs on the units performances, and action photos of the units in their many applications.

* * *

The typical applications listed include textile, plastic, paper and metal fields, either in web or filament form. For a free copy of the brochure, write to Web Controls Corporation, 318 Briarcliffe Road, West Englewood, N. J.



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HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. Dearborn Street, Chicago 5, Illinois

Evaluation of Stress-Strain Recorders

(*Continued from page* 616)

were less than one percent except for isolated points at the lowest and highest loads.

* * *

In determining the accuracy of load and extension indications of a recorder, the effects of expansion and contradiction of chart paper must be eliminated. This was accomplished by measuring the length of the recorder plot directly rather than reading its length from the paper grid. A separate evaluation of the dimensional stability of the paper was also carried out.

Stability of Chart Paper

The effects of relative humidity on the stability of the paper were studied by exposing three samples of chart paper from each recorder to constant relative humidities from 40 to 80 percent. The use of two microscopes permitted a comparison of the chart paper with a calibrated steel scale. In this way the expansion and contraction were measured over a 7-in. length at 70° F both with and across the grain. Error introduced by humidity was found to be a significant factor. For example a 40 percent change in relative humidity changed the length of the paper across the grain by 0.6 to 0.7 percent. The uniformity of the grid of the chart paper was also measured. Each one-tenth of an inch division deviated from the average by less than 0.0004 in.

* * *

The results obtained in this study are presumed typical of the performance of the majority of recorders in use, showing the stress-strain recorder to be a reasonably accurate instrument suitable for the type of tests in which it is employed. However, periodic calibration of each recorder-extensometer combination is, of course, necessary to insure the satisfactory performance of which it is capable.

Six *advantages from just* One *dip!*

and ONE DIP *is all that is necessary for coating wire and steel rods . . .*

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The Spectra-Strip Wire & Cable Corporation presents the latest idea in extensible cables and harnesses. Named "Spectra-Flex" by the manufacturer, this type of cable can be made in hundreds of conductors and in gages from 10 AWG to 30 AWG. Shielded wire, coaxial leads and Thermocouple pairs can all be included; any type having a vinyl plastic jacket.

* * *

Physical dimensions can vary from the miniature of an XY plotter weighing a few grams, up to and beyond the latest design for General Electric, which carried 342 conductors of Thermocouple and Transducer wires totalling over 25M ft. of wire per assembly with a 4 to 1 expansion of the coil.

* * *

Details and illustrated brochure available from **John Ford,** Sales Manager, Spectra-Strip Wire & Cable Corp., P.O. Box 415, Garden Grove, Calif.

Wet Wiredrawing

(*Continued from page* 610)

usual to increase the reduction in area of the wire at each die to at least 3% above what may be termed the "inbuilt R. in A." of the machine. Taking the example given above the result would be:

Finishinng block speed	**2500 fpm.**
Inbuilt elongation of machine	**13.5%**
Inbuilt R. in A. of machine	**12% per cone**
Actual speed of last cone	**2220 fpm.**
R. in A. of wire	**15.4% per die**
Elongation of wire	**18% per die**
Wire required from last cone	**2140 fpm.**

In this case, selection of die sizes would be made, starting at the finished size, by calculating 15.4% reduction in area per die, working backwards. This is called a "drafting".

* * *

It can be seen that the last cone is running 80 ft. per min. faster than the amount of wire which can be taken by the block; however there is no build-up on the cone as with the dry machines, but the wire slips back on the cones, which are travelling faster. That is why wet wiredrawing is sometimes referred to as slip wiredrawing.

* * *

This point is illustrated in Figure 3. The speeds and reductions are not the same as in the example. Under the conditions shown there is considerable slip at the beginning of the machine, increasing towards the middle and then decreasing to zero on the finishing block.

* * *

Slip is inherent in wet drawing machines. It generates heat which has to be dissipated by cooling, and causes friction which results in wear of cones or capstans. In order to start up the machines at all it is necessary to have some slip, but it would be a great advantage if this could be reduced once they were running. One maker of machines claims to do just this by means of a special gear box, and the effect can be seen in Figure 4.

* * *

Therefore in considering the purchase of continuous machines

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to produce wire for which either wet or dry drawing would be suitable, wet machines have the advantage over dry because they use only one motor, fewer gears and smaller cones. They also have the advantage in the size of the machines as related to floor space. On the other hand wet machines require more maintenance, chiefly on account of the wear caused by friction.

Conclusions

Certain classes of wire must be wet drawn to obtain the surface finish required. Only light reductions can be given to coppered or bright wire for which a particularly clean finish is necessary. The base wire for this must be prepared close to the machines, and suitable storage tanks and fume extraction installed.

* * *

Particular care must be taken in the preparation of wire before all wet drawing. Special coatings have to be applied to wire being prepared for drawing on continuous wet machines.

* * *

Whilst wet machines are less expensive to purchase than dry, they are more costly in production materials and in engineering maintenance.

Wire Kinks

(*Continued from page* 625)

content through the addition or evaporation of solvent, which would effect the flow characteristics of the enamel.

* * *

A metering tube is employed to provide a definite pressure drop — a direct function of viscosity. This liquid pressure differential is converted to an air pressure in the transmitter and then the converted air pressure is sent to the controller instrument, which is balanced with the high pressure air supply. The controller may be set at any desired point to maintain this set through the addition of solvent by means of the control valve. The system is in complete balance when the viscosity pressure (measured variable pressure) equals the control point pressure.

* * *

The basis of the viscosity controller is the Poissculle flow equation, which is expressed as follows:

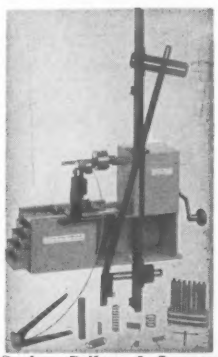
$$p = 32\mu\ Lu/sd^2$$

Where:

p = pressure drop in lb./sq. ft.
μ = viscosity in lb./sec./ft.
L = tube length in ft.
u = fluid velocity in ft./sec.
g = acceleration of gravity in ft./sec./sec.
d = diam. of tube in ft.

* * *

The viscosity of any fluid should be determined by the flow in the viscous flow range, which is ascertained through the use of the Reynolds number, the value of which must be less than 2100, the critical velocity where viscous flow begins to change to turbulent flow.



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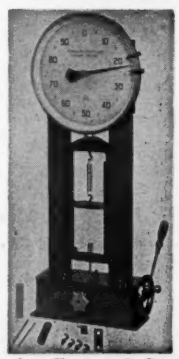

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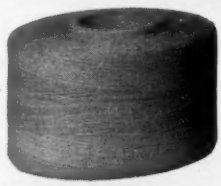

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PROCESSING AND TESTING EQUIPMENT

Ditridecyl Phthalate (DTDP) In High Temperature Vinyl Insulation

(*Continued from page 605*)

VII. Other Esters of Tridecyl Alcohol

The present data on DTDP suggest that other esters of tridecyl alcohol will find application in the vinyl insulation field. Some preliminary results have been obtained on two such esters that are of potential interest. These are decyl tridecyl phthalate (DTP) and ditridecyl adipate (DTDA).

* * *

Decyl tridecyl phthalate is a good balance between the plasticizer efficiency of DDP and the plasticizer permanence of DTDP. Pads of vinyl electrical formulation plasticized with DTP pass the Underwriters' Laboratories' 105° wire aging test (7 days at 136°C.). These DTP formulations do not have the margin of safety possessed by the DTDP formulations.

Since decyl alcohol is less expensive than tridecyl, it can be expected that DTP will be less expensive than DTDP; hence this balance of lower cost and better efficiency of DTP will be of interest.

* * *

Preliminary investigations of ditridecyl adipate show that it has a lower volatility than does DDA or DOS. DTDA is superior to DDA and equivalent to DOS in imparting low temperature performance to vinyl compounds. On heat aging, compounds with DTDA have retention of physical properties superior to those of DOS and equivalent to those of DDA. Thus DTDA appears to have performance characteristics intermediate between DDA and the higher-priced DOS (Table XI).

TABLE XI
DTDA AS A LOW TEMPERATURE PLASTICIZER FOR POLYVINYL CHLORIDE (1)

	DIOP-50	DIOP-38 DDA-12	DIOP-38 DTDA-12	DIOP-38 DOS-12
Original Properties				
Tensile, psi	2470	2505	2485	2480
Elongation, %	360	395	370	400
Modulus at 100%, psi	1300	1240	1315	1175
Clash Berg T_f, °C.	-21	-23	-27	-28
Aged 4 Days at 100°C.				
Tensile, psi	2495	2620	2580	2510
Elongation, %	310	365	370	370
Modulus at 100%, psi	1480	1495	1545	1355
Volatility, Wt. %	3.5	3.6	3.1	3.5
Aged 7 Days at 100°C.				
Tensile, psi	2615	2505	2540	2475
Elongation, %	290	370	350	330
Modulus at 100%, psi	1670	1570	1565	1440
Volatility, Wt. %	6.9	6.1	4.9	5.9
Extraction Tests				
Soapy Water, Wt. %	5.7	5.8	5.05	4.25
Hexane, Wt. %	23.5	27.6	26.8	25.7

(1) Formulation: PVC - 100; Plasticizer - 50; Ba-Cd Phenate - 2; Chelator - 0.5.

VIII. Conclusions

1. Phthalates based on oxo alcohols meet most vinyl insulation needs.

2. Tridecyl alcohol esterifies readily with phthalic anhydride.

3. DTDP-plasticized vinyl insulation passes the heat-aging requirements for 90° and 105° wire.

4. Other areas for DTDP-plasticized insulation include TW, THW, 60°C. oil-resistant, and jacketing compounds.

5. Decyl tridecyl phthalate and ditridecyl adipate are esters that should also be of interest as specialty plasticizers.

BIBLIOGRAPHY

1. **"Higher Oxo Alcohols," Enjay Company, New York.**
2. **Technical Bulletin No. 13, Enjay Company, New York.**

DIES and NOZZLES for INSULATING ELECTRIC WIRE

STEEL and CARBIDE

CENTRAL CARBIDE NOZZLES OR TIPS have extremely long life and cut costs.

Our STEEL DIES are made Round, Figure 8, Serrated, Tracer—or in special shapes.

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3. Fischer, W. F. and Young, D. W., U. S. Patent 2,625,521 (January 13, 1953).
4. Fischer, W. F. and Young, D. W., U. S. Patent 2,881,151 (April 7, 1959).

Clamping Springs for 1400° Brazing

(*Continued from page* 612)

plexity of the assembly. But N.R.K. has standardized on these springs for all jobs where spring fixturing is used from the longest production runs to the pilot runs or special orders for one unit because the savings and improved precision are realized on all runs.

* * *

A variety of spring sizes and shapes have been designed by N.R.K. from which the proper springs are selected for each of the many hundreds of different brazing problems with which they are confronted.

The Wire

NS-25 is a precipitation-hardened alloy wire, the principal constituents of which are cobalt (46 to 53%), chromium (19 to 21%), tungsten (14 to 16%), nickel (9 to 11%), and carbon (.05 to .15%). It is also designated as Alloy L-605.

* * *

The wire is made available annealed to a 35% reduction. In a typical reduction of 30%, it is made in 0.171 to 0.018 inch diameters. Tensiles for this size run from 200,000 to 240,000 psi, depending on the diameter of the wire. Elongation ranges from 4 to 8 percent for this reduction.

* * *

Before drawing, rods are welded together with magnetic stainless steel and since the NS-25 is nonmagnetic, welds in finished springs can be identified with a magnet. The springs made of this alloy are able to operate at ambient temperatures of 400° to 1400°F. without loss of springiness.

* * *

As supplied for automatic spring coiling machines, the wire has a gray oxide finish that can be removed by nitric acid, tumbling, vapor blasting, or similar methods.

Name Change

Resulting from the recent purchase by the **American Enka Corporation** of the **Rex Corporation** of West Acton, Mass., and the **William Brand Company**, Willimantic, Conn., the firms have been merged and hereafter will be known as the **William Brand-Rex Division**, Enka Corp.

* * *

Integrated administrative, manufacturing and sales personnel will be located at 31 Sudbury Road, Concord, Mass., while operating and purchasing personnel will continue to be located at the Willimantic and West Acton plants as heretofore.

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Stranders — 7-bay and 12-bay.
1 Davis Standard 48" Dual Capstan complete with Drive.
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WIRE & TEXTILE MACHINERY INC.
P. O. BOX 436, PAWTUCKET, R. I.

Insulated Wire Manufacturing Costs Trimmed With Diameter Control Gauge

(*Continued from page* 601)

change in the rate of wire travel controls the thickness of the vinyl coating.

* * *

To keep the gauge from constantly "searching" for the right diameter, a wire speed sensing device is used. This allows the length of wire from extruder to gauge — about 200 feet for this particular line — to clear the gauge head after each correction of diameter, and so prevents the gauge from continuous re-correction or "hunting". If further correction is necessary, the cycle is repeated after about 200 feet of wire clears the gauge.

* * *

The gauge's space requirements are very small — it sandwiches vertically on an angle iron frame between the line's "sparker" and "dancer column."

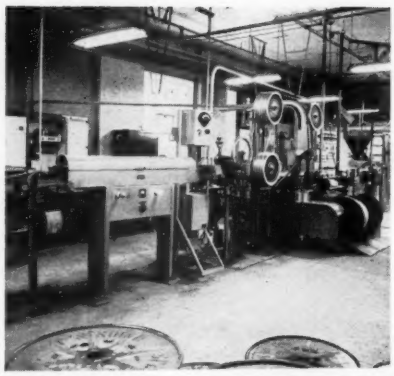

Figure 4 — American Metal Moulding Co. line pays off precision insulated building wire to automatic dual reel take-up at rate of 1,000 feet per minute continuously, thanks to photoelectric gauging system. Reels are filled, then automatically separated by mechanical clippers and made ready for manual removal.

The wire line in the plant is among the most advanced in the country. Besides using the photoelectric gauge, the company employs a-c drives for its extruder, capstan, and take-up, in place of the conventional d-c units. In addition, a cooling system has been installed to regulate the water bath for the hot wire emerging from the extruder. The wire runs through the water in a 55-foot long trough and the water is recirculated from a 2000-gallon underground tank. Before it reenters the trough, the coolant water passes through a 5-ton chiller which holds the water temperature at about 60°F.

* * *

All of the plant's line operations are automatic except for initial and final handling of reels and feeding of dry plastic granules to the extruder hopper.

* * *

Ultimately, the insulated wire produced is encased in flexible steel armor, and is used for residential, commercial, and industrial wiring.

Wire Cloth Representative Moves

Baldwin-McLean, Inc., direct mill representative for **New York Wire Cloth Co.,** York, Pa., has moved from New York City to 21 West Putnam Ave., Greenwich, Conn. **David G. Baldwin,** President, said the move would provide a more central location to the territories served, which includes New York State, northern New Jersey and all of New England.

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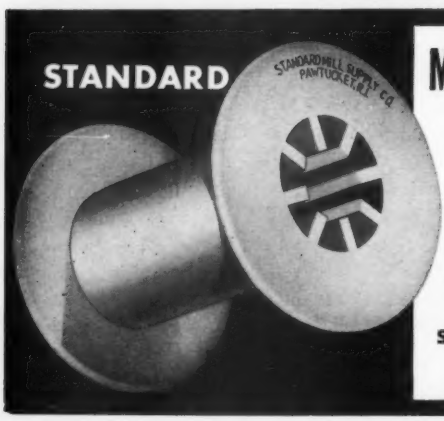

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Improved Paperwork Benefits Both Company and Customer

(*Continued from page* 599)

The employee group is an important one and we made absolutely sure that all employees, from the janitor on up, were kept fully appraised of what was happening. As a result, we had their complete confidence and support from beginning to end. Just how we would have fared had we arbitrarily installed the new system we do not know, but we certainly believe that our approach has paid handsome dividends.

* * *

Before we decided, even vaguely, that some improvements were necessary, we started preparing our employees for a possible change. Many of them are veterans with us, and it would be only natural that some opposition would be encountered. We wanted to get them on our side by showing them that there were better ways of doing things, that no jobs were in danger, and that they would have a say in whatever was done.

* * *

To these ends we started by showing films on work simplification, forms design, systems analysis, and so forth. These films, made and supplied by **The Standard Register Company,** gave the employees some things to think about, showed them how other companies were handling similar jobs. We gave this time to sink in before going on to the second phase, and then we moved along two parallel lines of action. On one we had Standard Register specialists going over our old system and charting a new one; at the same time, we held company conferences to which all personnel were invited and allowed to say whatever they felt needed saying.

* * *

These meetings were very important. Full discussion was allowed, ideas were suggested, points were argued, and everyone was given time to state his or her case for or against any procedure under study. As a result, every employee had a personal stake in the changeover and all were intimately acquainted with what was happening and how it would affect them and the company.

* * *

Our approach to installing new operating procedures is not necessarily the only one, but it was certainly a successful one. The benefits that accrued mean profit to the company — financially and physically. Co-operation has been excellent all through the changeover and since; and the veterans have been able to adjust to the new procedures without any complaints. Morale on the whole is high, our customers have commented favorably and are well-satisfied, and we in management feel that the company is far out in front.

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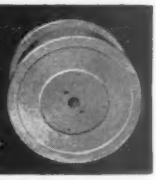

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Union Carbide Plastics Company, Div. of Union Carbide Corporation, New York, N. Y.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
Swift & Company, Chicago, Ill.
United States Borax & Chemical Corp., New York, N. Y.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

CONTAINERS—Wire Packaging
(See DRUMS—Wire Packaging)

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

COUNTERS—
(See MACHINERY—Measuring Wire and Cable)

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

CUTTING TOOLS—Carbide
Eastern Carbide Corp., New Rochelle, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Somerville, Mass.
Robinson, M. W. Co., Rockville, Conn.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIAMOND POWDERS—
Danforth Company, C.W., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Fort Wayne Diamond Products, Inc., Fort Wayne, Indiana
Hoosier Wire Die, Inc., Ft Wayne, Ind.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIAMOND POWDER RECLAIMING—
Danforth Company, C.W., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Fort Wayne Diamond Products, Inc., Fort Wayne, Indiana
Hoosier Wire Die, Inc., Ft Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Wayne Wire Die Co., Linden, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rivom, Dijon, France
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rivom, Dijon, France

DIES—Diamond
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Ft. Wayne Wire Die Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES DIAMOND—Reversible
Indiana Wire Die Company, Fort Wayne, Indiana
National Wire Die Co., Inc., New York, N. Y.

DIES—Extrusion
Central Tool and Machine Co., Bridgeport, Conn.
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rivom, Dijon, France.
Rusch Wire Die Co., Croton-on-Hudson, N.Y
Wayne Wire Die Co., Linden, N. J.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Roll Threading
Rivom, Dijon, France

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Rivom, Dijon, France

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tinning
American Lava Corporation, Chattanooga, Tenn.
Roux Wire Die Works, Inc., Oriskany, N. Y.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die., Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rivom, Dijon, France
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DRAW BENCHES—
(See MACHINERY)—Draw Benches)

DRIVES—Variable Speed
Allis Co., Louis, Milwaukee, Wisc.

DRUMS—Wire Packaging
Hubbard Spool Company, Div., The American Pulley Co., Garrett, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Republic Steel Corp., Berger Div., Canton, Ohio

DRYING EQUIPMENT—
Carl Mayer Corp., The, Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Ajax Electric Company, Philadelphia, Pa.

FURNACES—Galvanizing Equipment
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen (W. Germany)
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Company, Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Ofenbau Fritz, G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Wilson Lee Engr. Co., Cleveland, Ohio

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Company, Philadelphia, Pa.
Ofenbau Fritz, G.m.b.H. & Co. K. G., Hagen, (W.-Germany)

FURNACES—Salt Bath
Ajax Electric Company, Philadelphia, Pa.

FURNACES—Strand Annealing
Ajax Electric Company, Philadelphia, Pa.
Ofenbau Fritz, G.m.b.H. & Co. K. G., Hagen, (W. Germany)

GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

GUIDES—For Wire
American Lava Corporation, Chattanooga, Tenn.
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

INSULATING MATERIALS—
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
General Tire & Rubber Company, The, Akron, Ohio
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plymouth Cordage Company, Plymkraft Division, Plymouth, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, Naugatuck, Conn.

LACQUERING SYSTEMS—See MACH.—Lacquering Electric Wire

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINE CONTROLS—Electronic
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Blast Cleaning
Wheelabrator Corporation, Mishawaka, Ind.

MACHINERY—Bobbin Winders
Associated American Winding Machinery, Inc., New York, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Larmuth and Bulmer, Limited, Manchester, England

MACHINERY—Bolt, Rivet, Screw, etc.
Boltmaster Co., The, Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Prutton Corporation, Cleveland, Ohio.
Straus-Artys Corp., Great Neck, N. Y.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Braiding
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Carter & Co., Ltd., B. & F., Bolton, England
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corporation, New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio

MACHINERY—Chain Making
Larmuth and Bulmer, Limited, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Closing Cable
Carter & Co., Ltd., B. & F., Bolton, England
Larmuth and Bulmer, Limited, Manchester, England
Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N.J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Cold Heading
Boltmaster Co., The, Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Herborn, Maschinenfabrik, Herborn, Germany
Johnson Machinery Co., Newark, N. J.
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden
National Mach'y Exch (Used), New York
Showa Machine Works, Ltd., Osaka, Japan
Steel & Wire Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Company, Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Maschinenfabrik, Herborn, Germany
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Diameter Control
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Sjogren Tool & Machine Co., Auburn, Mass.
Wayne Wire Die Co., Linden, N. J.

MACHINERY—Draw Benches
American Laubscher Corporation, New York, N. Y.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Eccentricity Control (Insulated Wire)
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Edging (See MACHINERY—Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Michigan Oven Company, Detroit, Mich.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Johnson Machinery Co., Newark, N. J.
Royle, John, & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Flat Wire
Fenn Manufacturing Company, Newington, Conn.
Mettler Machine Tool, Inc., New Haven, Conn.
Steel Equipment Company, Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
National Mach'y Exch. (Used), New York, N. Y.
Nilson Machine Co., A. H., Shelton, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel & Wire Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Footage Meters
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Galvanizing Wire
Miyazaki Iron Works, Ltd., Osaka, Japan
Orenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Impregnation Control, Paper Cables
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Insulation Testing (See MACHINERY—Spark Testing)

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia, Pa.
Cook Mfg. Co., The, Paterson, N. J.
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
EVG., Machinen & Stahl, A. G., Zurich, Switzerland

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Diam., Insulated Wire
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Larmuth and Bulmer, Limited, Manchester, England
National Standard Electronics, Inc., New York, N. Y.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Measuring and Control—Coating
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Measuring Width-Flat Wire
National Standard Electronics, Inc., New York, N. Y.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Co., Tiffin, Ohio
National Mach'y Exch. (Used), N.Y., N.Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Packaging Wire
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Patenting Wire
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Pin Making
Nilson Machine Co., A. H., Shelton, Conn.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Plating
Bartell Machine Tool Corp., Rome, N. Y.
Hodge Bros. Machine Shop, Ossining, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Printing on Electric Wire
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

MACHINERY—Re-Spooling
Associated American Winding Machinery, Inc., New York, N. Y.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Miyazaki Iron Works, Ltd., Osaka, Japan
National Mach'y Exch. (Used), New York, N. Y.
Vaughn Machinery Co., Cuyahoga Fall, Ohio
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill
Baldwin-Lima-Hamilton, Industrial Division, New York, N. Y.
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Fenn Manufacturing Company, Newington, Conn.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So San Francisco, Calif.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Slitting Mills
Steel Equipment Company, Cleveland, Ohio

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios Machinery Corp., Hackensack, N. J.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Staple Making
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Straightening & Cutting
American Laubscher Corporation, New York, N. Y.
Johnson Machinery Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Patterson, George C. Machine Co., Cleveland Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Steel & Wire Machinery Co., Cleveland, Ohio
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Bartell Machine Tool Corp., Rome, N. Y.
Carter & Co., Ltd., B. & F., Bolton, England
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Johnson Machinery Co., Newark, N. J.
Krupp, Fried., Machinen-Und Stahlbau Rheinhausen, Germany
Larmuth & Bulmer Limited, Manchester, England
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Fenn Manufacturing Company, Newington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Tandem Rolling & Edging Mills
Fenn Manufacturing Company, Newington, Conn.

MACHINERY—Take-Up and Pay-Out
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
American Insulating Mach'y Co., Phila., Pa.
Associated American Winding Machinery, Inc., New York, N. Y.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Johnson Machinery Co., Newark, N. J.
Larmuth & Bulmer Limited, Manchester, England
Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Thread Rolling
Boltmaster Co., Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Prutton Corporation, Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.

Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyanoga Falls, Ohio

MACHINERY—Tube Mill, Cold Drawing
Johnson Machinery Co., Newark, N. J.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
Johnson Machinery Co., Newark, N. J.
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Welded Wire Mesh
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Schlatter, Ltd., H. A., Zollikon/Zurich

MACHINERY—Variable Speed Drives
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery—Welding Wire Fabrics)

MACHINERY—Winding Wire
Associated American Winding Machinery, Inc., New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Larmuth and Bulmer, Limited, Manchester, England
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York, N. Y.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Company, Newington, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Johnson Machinery Co., Newark, N. J.
Loma Machine Manufacturing Co., Inc., New York, N. Y.
Miyazaki Iron Works, Ltd., Osaka, Japan
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Showa Machine Works Ltd., Osaka, Japan
Sleeper & Hartley, Inc., Worcester, Mass.
Societa Generale Delle Macchine Mill, Milan, Italy
Steel Wire and Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Superior Tool & Machinery Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wire Machinery Inc., Chicago, Ill.

MACHINERY—Wire Preheating
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.

MACHINERY—Wire Rope
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
American Laubscher Corp., New York, N. Y.
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Company, Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio

MOTORS—Electric
Allis Co., Louis, Milwaukee, Wisc.

NAIL TOOLING—Tungsten Carbide
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pan American Trade Development Corp. New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Central Tool and Machine Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Company, Winsted, Conn.
Michigan Oven Company, Detroit, Mich.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAPER—Coil Wrapping
Ludlow Papers, Needham Heights, Mass.

PAPER—Insulating
Ludlow Papers, Needham Heights, Mass.
Plymouth Cordage Company, Plymkraft Division, Plymouth, Mass.
Twitchell, Inc., E. W., Philadelphia, Pa.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Cary Chemicals, Inc., New Brunswick, N. J.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

PLASTICS—for Wire Insulation
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Escambia Chemical Corporation, New York, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Union Carbide Plastics Company, Div. of Union Carbide Corporation, New York, N. Y.
Union Carbide Corporation, Silicones Division, New York, N. Y.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, Naugatuck, Conn.

PRINTING WHEELS—for Electric Wire
Daniels & Co., Frank, New York, N. Y.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

PULLEYS—Ceramic
American Lava Corporation, Chattanooga, Tenn.

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Mettler Machine Tool, Inc., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Berger Div., Canton, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark Manufacturing Co., J. L., Rockford, Illinois.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
New York Engineering Corp., Yonkers, N. Y.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Steel, for Rope and Cable
New York Engineering Corp., Yonkers, N. Y.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Nelson Co., The, Baltimore, Md.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Wood Working Co., Montello, Wisc.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Nelson Co., The, Baltimore, Md.

REFRACTIONS—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Pan American Trade Development Corp. New York, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

ROPE—Wire
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons, Div. Colorado Fuel & Iron Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Removing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SATURATION SYSTEMS—
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—For Retail Sale of Wire
Clark Manufacturing Co., J. L., Rockford, Illinois.

SPOOLS—Plastic
Associated American Winding Machinery, Inc, New York, N. Y.

Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Div. Colorado Fuel & Iron Corp., Trenton, N. J.

TANKS—Ceramic, for Galvanizing
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, W.-Germany)

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TENSION METERS—for Wire
Boulin Instrument Corporation, Pelham, N. Y.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
Tensitron, Inc., Harvard, Mass.

TESTERS—INSULATION
(See Testing Equipment—for Dielectric Faults)

TESTING EQUIPMENT — Dielectric Faults in Insulation
Davis Electric Co., Wallingford, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Muirhead Instruments, Inc., (Addison Electric), New York, N. Y.
Peschel Electronics, Inc., Patterson, N. Y.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

TESTING EQUIPMENT — Physical
Scott Testers, Inc., Providence, R. I.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

TRANSMISSIONS—Variable speed (See Adjustible Speed Drives)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Associated American Winding Machinery, Inc., New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Hodge Bros. Machine Shop, Ossining, N. Y.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Insulating Materials Section, Schenectady, N. Y.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WAXES—for Insulated Wire
Cary Chemicals, Inc., New Brunswick, N. J.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Micro Products Co., Chicago, Ill.
Schlatter, Ltd., H. A., Zollikon-Zurich

WHEELS—for Printing on Electric Wire
Daniels & Co., Frank, New York, N. Y.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

WIRE—Aluminum
Malin & Co., The, Cleveland, Ohio
Scovill Mfg Co., Waterbury, Conn.

WIRE—Ball
Marathon Specialty Steels, Inc., N. Y., N. Y.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.

WIRE—Bunched and Stranded
Camden Wire Company, Camden, N. Y.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Scovill Mfg. Co., Waterbury, Conn.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Copper
Camden Wire Company, Camden, N. Y.
Malin & Co., The, Cleveland, Ohio

WIRE—For Electrical Conductors
Camden Wire Company, Camden, N. Y.

WIRE—Flat
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Jones & Laughlin Steel Corp, Stainless and Strip Div., Detroit, Mich.
Montgomery Co., The, Windsor Locks, Conn.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pan American Trade Development Corp., New York, N. Y.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado, Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Detroit Steel Corporation, Detroit, Mich.
Marathon Specialty Steels, Inc., New York, N. Y.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Marathon Specialty Steels, Inc., N. Y., N. Y.
Republic Steel Corp., Berger Div., Canton, Ohio
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Metalizing
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Platt Bros & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Malin & Co., The, Cleveland, Ohio
Suzuki Metal Industry Co., Ltd., Tokyo, Japan

WIRE—Needle
Marathon Specialty Steels, Inc., New York, N. Y.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
Pan American Trade Development Corp., New York, N. Y.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Suzuki Metal Industry Co., Ltd., Tokyo, Japan
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE Prestressed Concrete Reinforcement
Suzuki Metal Industry Co., Ltd., Tokyo, Japan

WIRE—Special Shapes
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Marathon Specialty Steels, Inc., N. Y., N. Y.
Pan American Trade Development Corp., New York, N. Y.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Suzuki Metal Industry Co., Ltd., Tokyo, Japan
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Stainless Steel
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Malin & Co., The, Cleveland, Ohio
Nippon Stainless Steel Wire Mfg. Co., Ltd., Osaka, Japan
Pan American Trade Development Corp., New York, N. Y.
Suzuki Metal Industry Co., Ltd., Tokyo, Japan
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Steel—Also Coppered and Galvanized Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
Pan American Trade Development Corp., New York, N. Y.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tire Bead
Suzuki Metal Industry Co., Ltd., Tokyo, Japan

WIRE—Upholstery and Mattress
Pan American Trade Development Corp., New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARN TESTERS—
National Standard Electronics, Inc., New York, N.Y.
Scott Testers, Inc., Providence, R. I.

YARNS—Wire Insulating
Chadwick Yarn Company, Pawtucket, R. I.
Synthetic Thread Co., Bethlehem, Pa.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 16, NEW JERSEY, U. S. A.

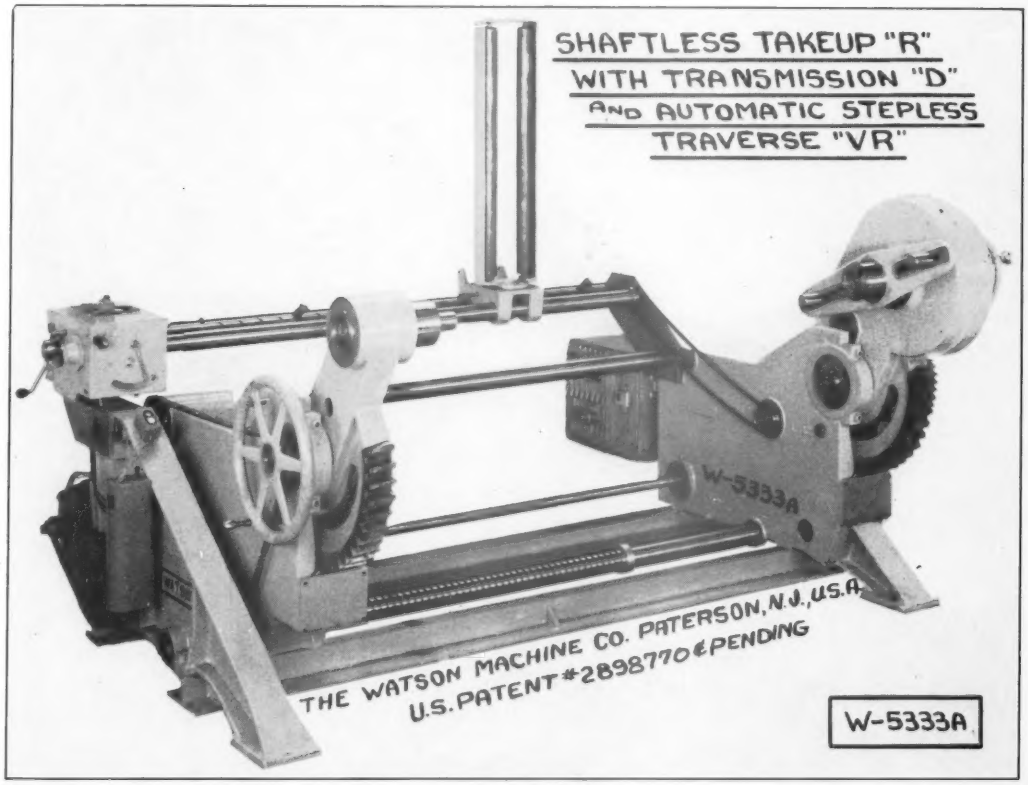
ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE
AND MASTICATING MACHINERY MANUFACTURERS

WATSON

AS THE ORIGINATORS OF "SHAFTLESS" TAKEUPS WE ARE PLEASED TO INTRODUCE OUR LATEST MODEL.

NEW "SHAFTLESS" TAKEUP TYPE "R"

U. S. PATENTS 2,898,770 & 2,909,339



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ABSOLUTE MINIMUM FLOOR SPACE REQUIRED BEYOND MAX. REEL DIMENSIONS.

NEW, INDEPENDENT "COAXIAL" REEL DOG AND PINTLE MANIPULATION.

INPUT ADAPTABLE TO ANY DRIVE.

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HIGHER WINDING SPEEDS THAN OTHER TAKEUPS OF COMPARABLE SIZE.

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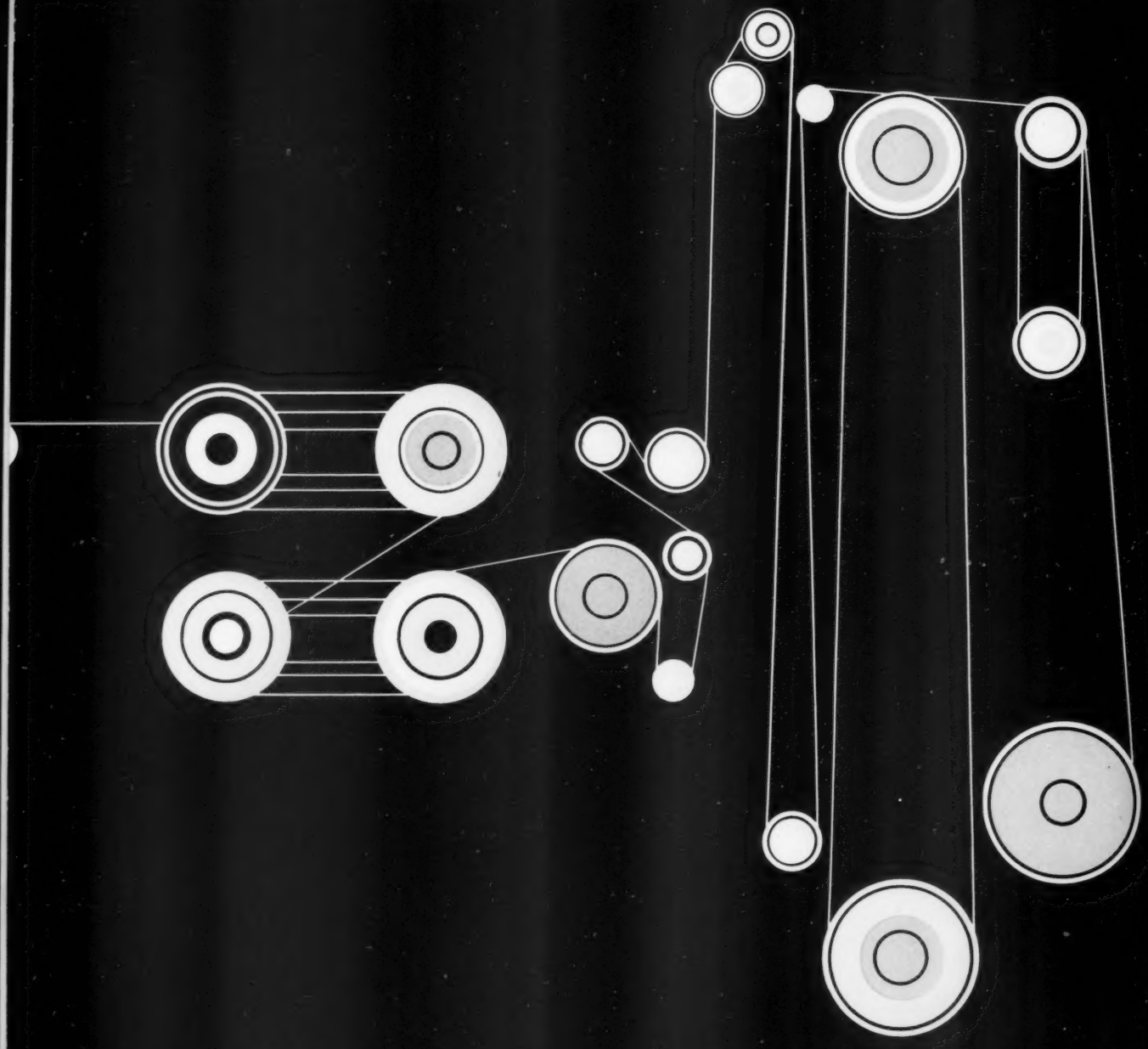
5-60



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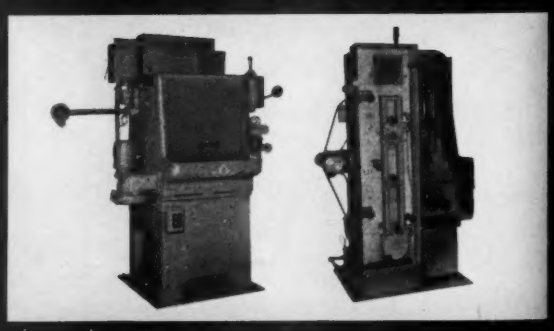

Resistoneal and Spooler model AB-3S and the Syncro model BG wire drawing machine.

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